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Draft Environmental Impact Statement for Proposed Arizona Hazardous Waste Management Facility

(U.S.) Environmental Protection Agency
San Francisco, CA

Prepared for

Arizona State Dept. of Health Services, Phoenix

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Region 9
215 Fremont Street
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EPA 909/9-83-001
January, 1983

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Draft

Arizona Hazardous Waste Facility

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The State of Arizona has asked to purchase a one-square mile parcel of land from the U.S. Bureau of Land Management for siting a state-owned, contractor-operated hazardous waste facility. At BLM's request, EPA agreed to serve as lead agency in preparing the EIS on the proposed land transfer.

This EIS addresses concerns related to selection of a facility site. Impacts related specifically to the design and operation of the facility itself would be addressed through future permits issued by EPA and the Arizona Department of Health Services.

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(CONTINUATION) ABSTRACTS

In this EIS, potential impacts have been assessed using representative facility designs typical of facilities which handle the types and amounts of wastes generated in Arizona. Alternatives considered are the State's proposed site near the community of Mobile, alternative sites in the Western Harquahala Plain and the Ranegras Plain, and the No Action Alternative. For each site, the EIS considers potential impacts on ground water, air quality, public health and safety, biological communities, cultural resources, and other resources. Mitigation measures are identified for those impacts which would not be addressed through the facility's permits.

January 1983

DRAFT
ENVIRONMENTAL IMPACT STATEMENT
FOR
PROPOSED ARIZONA HAZARDOUS WASTE MANAGEMENT FACILITY

Prepared by:

U.S. Environmental Protection Agency
Region 9
Toxics and Waste Management Division
San Francisco, California

Cooperating Agencies:

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U.S. Bureau of Land Management
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DRAFT ENVIRONMENTAL IMPACT STATEMENT

PROPOSED ARIZONA HAZARDOUS WASTE FACILITY

LEAD AGENCY:

U. S. Environmental Protection Agency

COOPERATING AGENCIES:

Arizona Department of Health Services
U. S. Bureau of Land Management

PROPOSED ACTION:

Sale of Federal land to the State of Arizona for siting a hazardous waste management facility.

ABSTRACT:

The State of Arizona has asked to purchase a one-square mile parcel of land from the U. S Bureau of Land Management for siting a state-owned, contractor-operated hazardous waste facility. At BLM's request, EPA agreed to serve as lead agency in preparing the EIS on the proposed land transfer.

This EIS addresses concerns related to selection of a facility site. Impacts related specifically to the design and operation of the facility itself would be addressed through future permits issued by EPA and the Arizona Department of Health Services.

In this EIS, potential impacts have been assessed using representative facility designs typical of facilities which handle the types and amounts of wastes generated in Arizona. Alternatives considered are the State's proposed site near the community of Mobile, alternative sites in the Western Harquahala Plain and the Ranegras Plain, and the No Action Alternative. For each site, the EIS considers potential impacts on ground water, air quality, public health and safety, biological communities, cultural resources, and other resources. Mitigation measures are identified for those impacts which would not be addressed through the facility's permits.

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ABBREVIATIONS

ADHS	Arizona Department of Health Services
ADOT	Arizona Department of Transportation
BLM	Bureau of Land Management
CAP	Central Arizona Project
DES	Arizona Division of Emergency Services
DOT	U.S. Department of Transportation
DPS	Arizona Department of Public Safety
EPA	U.S. Environmental Protection Agency

SUMMARY

PURPOSE AND NEED

The State of Arizona proposes to purchase a one-square-mile parcel of federal land from the U.S. Bureau of Land Management (BLM) for the purpose of siting a hazardous waste management facility. The land, near the community of Mobile, Arizona, was selected by the State Legislature after reviewing a siting report prepared by the Arizona Department of Health Services (ADHS) which evaluated potential sites for a hazardous waste management facility.

The proposed facility would be designed to treat, store, and dispose of hazardous wastes that are generated in Arizona but are not disposed of on the generator's property. The state would own the land while a private contractor would finance, build, and operate the facility.

Based on the requirements of the National Environmental Policy Act of 1969, BLM determined that an Environmental Impact Statement (EIS) would have to be prepared for the transfer of federal land to the State of Arizona for the proposed facility. This EIS assesses the potential environmental impacts which are of concern to BLM in its decision on the requested sale of land. Specific impacts related to the design and operation of the facility itself would be addressed through permits issued by EPA and the state. An EPA hazardous waste facility permit, which would be subject to public review and comment, would have to be obtained before facility construction could begin.

PROPOSED SITE AND ALTERNATIVES

In its siting report to the State Legislature, ADHS recommended three potential siting areas: Western Harquahala Plain, Ranegras Plain, and the Mobile area (in the southern part of Rainbow Valley). In February 1981, the legislature passed SB 1033 (ARS 36-2800) designating the Mobile site as the location for the facility. The proposed site and two alternative sites, as well as the no-action alternative (i.e., no sale of BLM land to the state) are considered in this EIS.

The Mobile site is located about 6 miles southwest of the community of Mobile, which is about 65 miles southwest of Phoenix. The Western Harquahala Plain site is approximately 90 miles west of Phoenix, south of I-10. The Ranegras Plain site is about 100 miles west of Phoenix, a few miles southwest of the Western Harquahala Plain site.

AFFECTED ENVIRONMENT

The proposed and alternative sites are located in broad, gently sloping desert plains in rural areas. The population in the vicinity of each of the three sites is low: 25 people live within 5 miles of the Mobile site and 5 people live within 5 miles of each of the alternative sites (Western Harquahala Plain and Ranegras Plain).

None of the sites is accessible via paved roads. The Mobile site is served by an unpaved road between Maricopa and Gila Bend, which is accessible from I-10 via paved county roads to Maricopa. The Maricopa-Gila Bend road is also accessible from an unimproved road from the northern part of Rainbow Valley. The two alternative sites are reached via unimproved roads from I-10.

There are no perennial surface waters on any of the sites. Washes at the sites may flow after a heavy rainfall. The Mobile site contains larger washes than the alternative sites. The Central Arizona Project (CAP) canal passes near the Western Harquahala site.

Ground water is the primary source of water in each area. The water table is estimated to lie at a depth of around 500 feet at the Mobile site; 340 to 390 feet at the Western Harquahala Plain site, and 320 to 340 feet at the Ranegras Plain site.

Air quality data suggest that the background levels of most air pollutants in each area are below state and national ambient air quality standards. Total suspended particulates (e.g., dust) sometimes exceed the standards, but this is due to natural weather conditions such as dust storms rather than man-made sources of particulates.

Limited emergency services are available near the sites. The closest community capable of providing emergency services to the Mobile site is Casa Grande. The nearest community with emergency services in the Ranegras Plain and Western Harquahala Plain area is Quartzite. Otherwise, the closest emergency services are in the Phoenix area.

Land on and around each site is used primarily for livestock grazing. Some hiking trails exist near the Mobile site. Major recreational activities in the three areas are hunting and off-road vehicle use.

No archeological, historical, or Native American resources have been identified on any of the sites. However, several archeological sites have been recorded in the vicinity of the Harquahala Plain and Ranegras Plain sites. No endangered plant or animal species are known to occur at any of these sites. Some plant species protected under the Arizona Native Plant Law are found at the Mobile and Ranegras Plain sites.

POTENTIAL IMPACTS AND MITIGATION

Physical Setting

The physical impacts would generally be the same at each site. Approximately 58 acres would be permanently affected by the facility and creation of new access roads into the site from existing roads. Potential effects would include alteration of the local topography, disturbance of vegetation and wildlife, and increased wind and water erosion. Areas impacted only during construction would likely revert to their natural state over a period of years.

To mitigate the physical impacts, ADHS would ensure that the facility contractor would make efforts during construction to minimize the disturbance of soil and vegetation in adjacent areas, erosion by either wind or water, and long-term stockpiling of soil. In addition, adequate surface drainage would be provided.

Water Resources

Ground Water--

The potential for impacts on water resources would center around contamination of the ground water. Based on available data concerning regional geology, depth to ground water, ground water flow rates, and protective measures required by federal and state regulations, the possibility of hazardous contaminants reaching water supply wells is remote. Such drinking water contamination could occur only if (a) the facility released several thousand gallons of waste or highly contaminated water (leachate) over a long time, (b) the ground water contamination was not detected through site monitoring, and (c) corrective action to prevent further migration of the leachate or contaminated ground water was not taken.

At the Mobile site, it would likely take from 270 to 370 years for contaminated ground water to reach the nearest existing wells. At the Western Harquahala Plain site, it would take between 2,700 and 11,000 years to reach the nearest existing wells, while at the Ranegras Plain site it would take from 2,250 to 6,750 years. Given the substantial time involved in movement of contaminated ground water from the site to the nearest wells, it is impossible to project the specific public health consequences of such an occurrence.

Specific ground water protection measures would be addressed in the facility's federal and state permits. The facility contractor would be required to obtain site-specific hydrogeologic data. ADHS would work with the contractor to ensure that the facility design provided adequate protection of ground water as well as the capability of detecting movement of hazardous constituents out of the facility.

Surface Water--

At the Mobile site, rainwaters and floodwaters appear to flow through well-defined washes crossing the site. If the facility were not adequately designed to withstand flooding from intense storms, run-off from the surrounding watershed could flood the facility and carry contaminants into Waterman Wash, resulting in a potential public health problem downstream. Diversion of storm waters around the facility as a flood protection method could affect drainage patterns in the vicinity; the flow of storm water into the Northwest (cattle watering) Tank could increase.

There are no significant, well-defined washes at either the Western Harquahala or the Ranegras Plain sites. These sites are subject to sheet flooding which drains into washes off-site. No significant impact on area drainage patterns is expected due to diversion of storm water run-off around the facility.

The potential for sheet flow to flood the facility is low. However, flooding of the Western Harquahala Plain site is possible in the event of an overflow of the CAP canal nearby. This could wash contaminants into Bouse Wash and pose a potential public health problem downstream. Since the CAP canal is designed to avoid or control overflow, such an event is unlikely.

Flood protection would be addressed in the facility permit. At the Mobile site, ADHS would require the facility contractor to design the facility so as to protect against a 100-year storm. At the Western Harquahala Plain site, ADHS would require the contractor to evaluate the potential for a flood caused by overflow of the CAP canal. Drainage patterns in the area and appropriate surface water controls should be carefully evaluated and incorporated into the facility design. Appropriate protective measures, such as berms, ditches, dikes, etc., would be incorporated into the facility design.

Air Quality

Emissions of total suspended particulates (TSP) (e.g., dust, dirt) from construction activities would be expected to add an estimated 10 ug/m^3 to the ambient concentrations, exacerbating occasional TSP problems from natural sources (e.g., dust storms). Volatile organic compound (VOC) emissions from facility operations could exceed 300 tons/year, making the facility subject to Prevention of Significant Deterioration (PSD) review if the emissions were determined to be "non-fugitive." Based on the limited information available for this analysis, the levels of hazardous pollutants emitted into the air from facility operations (surface impoundments, landfarm, landfill) would not be expected to be significant.

The impact of particulates on air quality could be reduced through the use of various dust control methods, such as paving roads, using dust suppressants on unpaved roads or other disturbed areas, ceasing construction during periods of high wind, using dust suppressants on overburden storage piles and landfill areas, and revegetating closed or unused areas. ADHS and the contractor should carefully evaluate the potential for hazardous emissions from the facility.

Public Health and Safety

Emergencies During Operation--

Experience at existing hazardous waste facilities shows that a probability of 0.5 operational spill per year could be expected at the proposed facility. The impact of a spill would depend on the type of waste, weather conditions, and other factors. Toxic air emissions could result from spills of materials which are easily volatilized, or from fires.

Specific spill prevention, countermeasures, and contingency plans would be prepared as part of the facility permit. The impact of operational spills can be reduced by, among other measures, (a) monitoring to ensure early warning of released chemicals, (b) grading waste handling areas to a centralized collection point for spilled liquids (where appropriate), and (c) incorporating an emergency spill collection and treatment system as part of the overall engineering design. ADHS would work closely with the facility contractor in developing plans for this facility.

Transportation Risks--

Transportation accidents (spill of hazardous waste during shipment) present special problems. The risk of accidents from the shipment of hazardous wastes is low, ranging from 0.02 to 0.13 accident per year from Phoenix to the Mobile site, depending on the route. However, the population at risk from these accidents is high, ranging from 104,000 to 133,000, depending upon the accident probability and the size of population residing in the potential impact areas located along the routes. The accident probabilities for routes from Tucson to the Mobile site may range from 0.01 to 0.02 accident per year. The population at risk along the same routes is lower than that for the routes from Phoenix, ranging from 55,350 to 55,950 persons. The students at the Mobile School, located on the Maricopa-Gila Bend Road, may be considered a special population at risk from spills and other truck accidents.

The risk of accidents on routes into the Western Harquahala Plain and Ranegras Plain sites is greater than that on routes into the Mobile area, due to the higher accident rates on the roads connecting the completed sections of I-10 west of Phoenix. The accident probabilities for both sites, however, are low, ranging from 0.05 to 0.18 accident per year for routes from Tucson and Phoenix, respectively. The population at risk is estimated at 60,000 and 103,000, respectively, for hazardous waste shipments from Tucson and Phoenix to the site. The potential for spills into the CAP canal presents a special hazard. However, the probability of a spill into the CAP canal during actual crossing, or within a mile of the canal, is extremely low because the trucks are in those areas for a very short time.

In summary, the impact of a chemical spill to the population on an access route to any of the sites could be significant. The probability of such an occurrence, however, is low.

To minimize the accident rate and reduce the population at risk, ADHS would (a) consider the frequency of accidents and the number of people at risk in designating transit routes to the facility; (b) work with the Arizona Division of Emergency Services (DES) to revise the State Emergency Response Plan as needed and to brief responsible agencies; and (c) work with the county highway departments to ensure that access road improvements consider safety concerns raised in this EIS.

Off-Site Emergency Response--

There is presently a lack of formal preparedness activities with respect to hazardous waste incidents in the affected counties. The emergency response teams in nearby communities and the Phoenix area could become overburdened if they are called upon to serve the facility in addition to their present responsibilities.

To limit the severity of public health and safety impacts from incidents, ADHS would continue to work with DES in upgrading the State's Emergency Response System to ensure that the public safety agencies would be adequately prepared with respect to equipment, personnel training, and incident alert systems.

Valley Fever--

There is evidence to suggest that Mobile and its immediate vicinity are a potential source of Valley Fever spores. The potential impacts on workers during construction of the facility could be significant due to the exposure to dense spore populations that may be released from soil disturbance. The probability of significant impacts on persons outside the site would be low. Occasional high winds could disperse spores from disturbed areas at the site to nearby populated areas. Evidence suggests, however, that the spread of Valley Fever, even under these conditions, would be low, since immunity is presumed to have been built up over time in most area residents.

There are no data on Valley Fever in the vicinity of the Western Harquahala Plain and Ranegras Plain sites. It is assumed that the potential for Valley Fever impacts would be similar to that at the Mobile site. The population subject to potential exposure to the spores, however, would be lower than at the Mobile site.

The severity of a Valley Fever outbreak can be minimized with appropriate precautions, such as (a) minimizing the area of soil disturbance, (b) identifying "hot spots" by sampling soils for spores, (c) confining soil-disturbing activities to periods of low wind, (d) landscaping and watering periodically or using chemical dust supressants, (e) requiring the contractor to consult with experts on the best practical control measures, (f) using face mesh respirators, where appropriate, and monitoring health records for indications of Valley Fever problems, and (g) providing specific information to workers.

Odors--

At all three sites, the impact of odors is expected to be minimal. Any odors originating at the facility would be expected to dissipate before reaching nearby residents. ADHS would establish a system to respond to odor complaints and work with the contractor to alleviate any problems. There are a number of measures that may be used to reduce odor impacts, including (a) prompt cleanup of spills, (b) covering stored or landfilled wastes, (c) screening hazardous wastes for odor generation prior to placing them in the evaporation ponds, and (d) applying odor reducing chemicals to wastes.

Noise--

Minimal noise impacts are expected to occur in areas near the transit routes through the major urban areas of Tucson and Phoenix because of facility traffic. Residents within approximately 700 feet of the roads in rural areas could experience peak noise at levels from approximately 65 to 85 decibels. Noise at these levels could cause annoyance, but the frequency and duration of each occurrence is expected to be low.

At the Mobile site, increased truck traffic through the town of Maricopa would be expected to cause noise at peak levels of approximately 60 to 85 dBA. Since traffic would occur primarily during the day, the same number of noise intrusions could impact the Mobile School and the Maricopa School during classes. Other communities along the Maricopa-Gila Bend road, including Mobile, would not likely be affected by noise intrusions because of their distance from the road. Noise at the facility would not be expected to affect Mobile because of the community's distance from the site.

No truck traffic noise impacts are expected at Western Harquahala Plain or the Ranegras Plain sites. The existing truck traffic on I-10 is heavy compared to that expected to be generated by the facility. There are no permanent residences on main access roads between I-10, and these sites are not expected to be impacted by truck traffic.

Noise generated by power equipment and trucks at the facility would not be expected to exceed Occupational Safety and Health Administration (OSHA) standards for occupational noise exposure.

To minimize noise impacts, ADHS would (a) require the facility contractor to restrict to daylight hours facility activities which may generate traffic, (b) establish a system and procedures for receiving and responding to public complaints about noise, and (c) if requested, monitor noise impacts on schools along the access roads and work with school officials to provide appropriate mitigation of any adverse impacts identified.

Ecological Resources

No threatened or endangered animal or plant species would be expected to be adversely impacted at any of the sites. Some state-protected plant species could be affected. Vegetation would be removed from those areas that are designated for construction of the facility and access roads or operations following construction activities. This loss of vegetation and disturbance of land would affect food, shelter, and nesting habitats of local wildlife. Some direct animal kills might occur. Since only a small population of these wide-ranging desert animals would be affected, the impact would be insignificant. The operation of evaporation ponds might pose a threat to the avian population attracted to the ponds as a source of water. Over a period of time, the bioaccumulation of hazardous substances may increase the number of bird deaths due to poisoning, as well as affect their birth rates.

All disturbed areas (with the exception of permanent structures) should be revegetated with native seeds similar to the existing vegetation of a given plant community, or mature plants. State-protected plants would be removed or relocated, where appropriate. Enhancement of vegetation may be expected along the access roads where drainage trenches would be constructed. Appropriate methods (e.g., physical barriers) should be used to prevent the intrusion of birds and burrowing animals such as rodents.

Land Use

No significant impacts on land use would be expected at any of the three sites as a result of the removal or loss of 640 acres (presently used for livestock grazing purposes) from the existing BLM grazing allotments. Only a minor impact on the recreation resources could result. Some of the uses, such as grazing, may recur after the facility has been fully closed, depending on the conditions of the permit.

Land use impacts could be mitigated by reimbursing the owner or permittee for range improvements as applicable.

Visual Resources

The facility would stand in significant contrast to the existing visual environment at the Mobile site. The impact of this visual contrast, however, would be low because of the relatively small number of recreational users of the area, and its distance from population centers.

The visual contrast would be less significant at the Western Harquahala Plain site because of the visual disturbances from the Highway (I-10). Other disturbances including the CAP canal, pipeline pumping station, the transmission line, and a microwave station, also reduce the quality of the visual environment.

At the Ranegras Plain site, the visual contrast of the facility would be similar to that at Western Harquahala, though the facility's visual intrusion may be significant to users of the Kofa Game Range and a nearby Wilderness Study Area. However, other visual disturbances already impact the visual experience: the transmission line, a windmill pump and water tank, dirt roads, and I-10.

Landform and vegetation disturbance should be minimized where possible to reduce visual impacts of the facility. Protective dikes and structures should also appear natural.

Cultural Resources

No recorded archeological, historical, or significant Native American resources have been identified at any of the sites, so no impact is anticipated. The facility would be expected to eliminate the gathering of subsistence plants by Native Americans on the site. Given the small area of the affected land, however, this impact would not likely be significant.

Prior to facility construction, the contractor would be required to identify cultural resources or confirm their non-existence. In the event a cultural resource were identified, the operator and ADHS would be required to coordinate with appropriate agencies to institute protective measures.

Socioeconomics

No significant economic/demographic impacts are expected at any of the sites. A small increase in tax revenues is expected; the level would be similar for all three sites. Revenues would be generated during the construction period from sales tax on the purchase of construction materials within the county, and from use tax revenue for out-of-state purchases. Because of conflicting effects on land values, it is not possible to project the impact of the facility on land values. Odors, traffic noise, and anxiety with respect to other possible public health and safety effects could cause deterioration in the quality of life to a small number of people.

Mitigating measures for socioeconomic impacts are identical to those measures for mitigating land use and public health and safety impacts. The contractor should consider local residents for jobs at the facility as appropriate.

No-Action Alternative

BLM's denial of the request to transfer the parcel of land to the state would mean that ADHS would either cease efforts to develop a state-owned hazardous waste management facility, or continue efforts to site the facility on land other than the sites considered in this EIS. This decision would be up to the State Legislature. In either case, development of a state hazardous waste management facility could be delayed for several years, if the siting effort continued.

Lack of an off-site disposal facility would leave the following options for waste disposal:

- On-site treatment, storage, or disposal. This option is increasingly less viable as the cost of complying with state and federal regulations for hazardous waste facilities rises.
- Out-of-state shipment of wastes. The high cost of this option has been cited as one of the reasons Arizona industries have supported the state site development effort.
- Illegal disposal. State authorities and industry leaders believe that lack of a commercial-scale hazardous waste facility could lead to an increase in illegal and environmentally unsound disposal practices.
- Development of a privately-owned facility. It is likely that any private siting effort would meet strong public opposition, thus making it difficult for a private firm to succeed in developing a new hazardous waste facility.

Purchase of an alternative site using state funds would require new legislation. The Legislature's option would be to reconsider sites already eliminated in ADHS's study or select a site not previously studied in detail. An alternative site could be on federal, state, or private land.

SECTION 1

PURPOSE AND NEED

INTRODUCTION

On May 18, 1981, the Arizona Department of Health Services (ADHS) requested that the Bureau of Land Management (BLM) sell one square mile of federal land for future location and operation of a hazardous waste management facility. The state's request set into motion the environmental analysis process required by the National Environmental Policy Act of 1969. This Act requires all federal agencies to develop Environmental Impact Statements (EIS's) for agency actions which may have a significant impact on the human environment. BLM determined that the sale of land for the express purpose of operating a hazardous waste management facility was a significant federal action requiring an EIS.

Since it does not have expertise in the area of hazardous waste management and facility development, BLM requested that the U.S. Environmental Protection Agency (EPA) act as the lead agency in preparing the EIS. EPA agreed, and has been joined by ADHS and BLM as cooperating agencies in the development of this document.

This EIS is designed to assess the potential impacts of the proposed facility on the environment. It will be used by BLM in deciding on the requested sale of land. Key concerns for BLM in making the decision include:

- Whether resources of significant value exist on this land which would cause BLM to retain it as public land for another use; such values would include, but not be limited to, cultural, biological, and/or natural resources.

- Whether the land would be unsuitable for siting a hazardous waste management facility.

- Whether the facility would be compatible with existing and probable future uses of adjacent lands.

This EIS addresses the general impacts of siting a representative facility in three separate areas: the proposed site, near the community of Mobile in the Rainbow Valley; an alternative site in the Western Harquahala Plain; and another alternative site in the Ranegras Plain. In addition, the EIS addresses the consequences of the "no action" alternative, that is, no sale of land to the state for this purpose.

Specific environmental concerns related to the design and operation of the facility itself would be addressed through permits issued by EPA and the state.

NEED FOR ACTION

The Legislature's Site Decision

In February 1981, the Arizona State Legislature enacted Senate Bill 1033 (ARS 36-2800). This law directed ADHS to purchase a specific parcel of land in Rainbow Valley near the community of Mobile for the purpose of siting a state-owned, contractor-operated hazardous waste management facility.

The Legislature's action followed completion of ADHS's siting report (1). The Legislature had mandated ADHS to prepare the report when it passed Senate Bill 1283 (ARS 36-2800) in April 1980. In passing SB 1283, the State Legislature assumed direct responsibility for selecting a site for the hazardous waste management facility. The Legislature took on this responsibility partly because earlier efforts by ADHS to propose a site had met public opposition.

ADHS's siting report evaluated a number of alternative potential siting areas and recommended the Western Harquahala Plain siting area as the location of the state hazardous waste management facility (see Section 2) (1). It noted that two other areas, Rainbow Valley and Ranegras Plain, were worth strong consideration. The report also included an analysis of the need for a facility to serve industries within the state which generate hazardous wastes. A summary of this analysis is presented below.

Need for the Facility

In the past very little was done to prevent the discharge of hazardous wastes into the environment. Traces of hazardous industrial pollutants have been encountered throughout the environment, including in humans, domestic livestock, and wildlife (1). Problems associated with air and water pollution have been largely addressed, but the problem of hazardous waste disposal, particularly on land, has not been similarly addressed. Consequently, adequate hazardous waste management practices need to be implemented to prevent further degradation of the environment.

State and federal regulations have been set into place to address this need for safe management and disposal of hazardous wastes (Appendices A and B). The regulations are designed to ensure that all such wastes are handled properly from the time they are generated until they are ultimately disposed of or rendered non-hazardous. Facilities which treat, store, or dispose of hazardous wastes must meet federal and/or state standards.

There are presently no approved off-site hazardous waste disposal facilities in Arizona. Wastes currently generated in the state are either stored, treated, or disposed on-site (at the facility which generates the waste), discharged to a sewer or waters of the United States, shipped out-of-state for treatment or disposal, or recycled. ADHS estimates that, in 1981, over 4.6 million tons of hazardous waste were treated on-site, sewered, and/or discharged to waters of the U.S. An additional 38,000 tons of hazardous waste required alternative treatment, recycling, or disposal because they could not be safely and legally disposed of in a sewer or waters of the U.S. (see Appendix C). The quantities of hazardous waste generated in Arizona are expected to increase 5 to 10 percent per year over the next two decades, due to industrial growth in the state (1).

As noted above, the state has decided to develop a state-owned hazardous waste management facility with the following objectives:

- To dispose of hazardous wastes in Arizona without affecting to any degree the health of this or future generations.
- To dispose of hazardous wastes in such a way that the operation can be adequately monitored and regulated by staff available to ADHS.
- To dispose of hazardous wastes by methods and in locations which would reduce the cost to the waste generators as much as possible, thereby encouraging safe management practices.
- To guarantee to waste generators in Arizona the existence of reasonably available hazardous waste disposal facilities.

THE FACILITY AND THE FACILITY PERMIT

Development of the proposed hazardous waste management facility would involve two major federal actions:

- BLM's decision on the sale of the proposed site.
- A subsequent decision by EPA to issue or deny a permit to build and operate the facility.*

This EIS assesses the environmental impacts of the proposed sale to ADHS of 1 square mile of federal land on which the facility would be built. The conditions of the land transfer, should it be approved and take place, will include a provision for a 0.5

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* The facility would also require a state permit, issued by ADHS (see Appendix B).

mile buffer zone around the facility to restrict incompatible land use adjacent to the facility and to monitor environmental conditions while the facility is in use. BLM would retain title of this buffer zone and it would be maintained through a cooperative agreement between ADHS and BLM.

No detailed description of the proposed facility will be available until a permit application and a design proposal are submitted to EPA and the state. The state is currently in the process of selecting a private company which, under contract to ADHS, would finance, construct, maintain, and operate the facility. If the land transfer were to take place, the contractor would be responsible for designing a facility which would meet federal and state standards and for submitting the required designs and permit applications.

For the purpose of assessing the impacts of the land sale, representative designs were developed for each type of treatment/disposal facility, based on typical practices for handling the types and quantities of wastes currently being generated in Arizona (see Appendix D). Table 1-1 summarizes the major features of the representative designs which were considered in this EIS.

EPA's permit decision would be a key step in developing the facility. The EPA permit would have to be issued before construction of the facility could begin, and it would be functionally equivalent to an EIS on the design and operation of the facility itself. A discussion of EPA's facility standards and the permitting process is included in Appendix A.

The permit applicant would develop and submit to EPA site-specific information needed to determine whether the proposed facility design would adequately protect public health and the environment. Site-specific concerns, such as site hydrogeology, which are addressed in very general terms in this EIS, would be addressed more fully in the permit application. As with an EIS, the permit would be subject to public review and comment.

SCOPING (ISSUE IDENTIFICATION)

After it was determined that an EIS would be needed for the proposed transfer of land, EPA issued a Notice of Intent to prepare the EIS. The Notice of Intent, which appeared in the Federal Register (January 20, 1982), announced two public meetings to be held in Mobile and Phoenix on February 18 and 19, 1982, respectively. The Notice was mailed to nearly 2,000 individuals, including representatives of federal, state, and local agencies, as well as private citizens.

The purpose of the Notice and public meetings was to involve the public and other government agencies in identifying significant environmental issues which needed to be addressed in the EIS. This process, called "scoping," was intended to focus the

TABLE 1-1. PROSPECTIVE FEATURES OF THE ARIZONA HAZARDOUS WASTE MANAGEMENT FACILITY

Feature	Treatment/Disposal Process	Waste Type
Surface Impoundment (Pond)	Neutralize acids with bases (or vice versa) by mixing them, then reduce volume by evaporation.	Acids/Alkalis
Surface Impoundment (Pond)	Reduce wastewater volume by evaporation.	Wastewaters with Heavy Metals
Surface Impoundment (Pond)	Destroy hazardous properties by chemical or biological treatment, then reduce volume by evaporation.	Dilute Cyanide Solutions
Storage Tank and Distillation Unit	Recover organic solvents from waste stream by distillation.	Various Solvents
Landfarm	Mix organic wastes with surface soils. The wastes are degraded by soil microorganisms.	Various Biodegradable Organics
Secure Landfill	Bury hazardous wastes in cells specifically constructed to avoid hazards to workers and the environment.*	Metal Sludges Cyanide Solids Pesticides Reactive Wastes Ignitable Wastes Halogenated Organics Miscellaneous Inorganics and Asbestos

* All wastes will be treated prior to landfilling by stabilization, fixation, solidification, etc.

EIS on the important environmental issues rather than those of little or no significance.

The public scoping meeting in Mobile was attended by over 60 people, while some 45 persons attended the Phoenix meeting. The meetings were conducted by the League of Women Voters, in cooperation with EPA, ADHS, and BLM. In addition to the comments made at the public meetings, EPA received written comments from 14 individuals, agencies, and organizations.

Many concerns raised in the scoping process relate to the design and operation of the facility rather than selection of the site. These issues would be addressed by federal regulation and the EPA facility permits (see Appendix A). The facility permitting process would not begin until and unless the land transfer takes place and a permit application is submitted by the contractor. The permitting process provides for public review of the draft permit so the public may comment on the proposed permit conditions.

Scoping participants raised a number of questions about the types, quantities, and sources of wastes to be received at the proposed facility. They also expressed concerns about out-of-state and nuclear wastes, and financial liability. Appendix C addresses the issue of out-of-state wastes and Appendix E is concerned with contractor financial liability.

The scoping process identified the following issues as pertinent to the selection of a site. They are addressed in Sections 2 and 4 of this EIS.

Alternatives

- Recycling as an alternative to disposal.
- Full consideration of alternative sites.

Physical Setting

- Potential for erosion.
- Potential for damage from subsidence and ground tremors.

Water Quality, Hydrogeology

- Seepage from the facility.
- Flooding problems.
- Need for extensive hydrogeologic data.

Air Quality

- Hazardous emissions from the facility.
- Effects of dust storms and wind storms on the facility.
- Increased dust due to facility traffic and construction.

Public Health and Safety

- Ability to handle fires and emergencies at the facility.
- Risks of locating a facility near communities.
- Transportation safety and access routes.
- Potential for contamination of dairy products and local produce.
- Risks to the Mobile School.
- Lack of adequate phone service in the Mobile area.
- Mix of refinery and waste facility truck traffic.
- Potential for spread of Valley Fever.

Wildlife

- Potential for birds to be attracted to surface impoundments.
- Impacts on threatened/endangered species.
- Potential damage to liners and containers by animals.

Other Resources

- Availability of mineral resources at the sites.
- Potential impacts on historical resources, such as the Butterfield Stage Route.
- Effects on the lifestyle of area residents.
- Effects on property values in the siting areas.
- Potential benefits for nearby communities.

A full summary of the comments made at the public scoping meeting and a summary of the written comments are available from EPA Region 9 in San Francisco and the Arizona Department of Health Services in Phoenix.

FURTHER STEPS IN THE DECISION-MAKING PROCESS

After public review of this Draft EIS, comments will be analyzed and a Final EIS will be prepared. The Final EIS will address concerns expressed in the comments on the Draft, and will be available for public review for a period of 30 days.

After the EIS has been completed and public comments have been received, BLM will complete a 60- to 90-day decision making process on the proposed sale. As part of this process, BLM will determine whether the proposed action meets the criteria for sale of federal land under Section 203 of the Federal Land Policy and Management Act (FLPMA). This includes the criterion that the sale of the land "will serve important public objectives" (FLPMA, Section 203a). BLM will then issue a Notice of Realty Action and a Record of Decision stating its decision concerning the proposed action. The Record of Decision, which is a public document, will state BLM's decision, identify the alternatives considered by the Agency, and specify the environmentally preferred alternative. It will also state whether all practical means to avoid or minimize environmental harm from the alternatives selected have been adopted, and if not, why. BLM may also discuss its preferences among the alternatives based on relevant factors, including economic and technical considerations and agency statutory mission (see 40 CFR 1505.2).

The Notice of Realty Action will be published in the Federal Register, and once a week for 3 weeks in newspapers of general circulation in the vicinity of the lands being offered for sale. The Notice will include the sale price, terms and covenants, conditions and reservations which are to be included in the conveyance document, and the method of sale (in this case, direct and noncompetitive). A period of 45 days after publication in the Federal Register will be provided for comment by interested parties.

No fewer than 60 days prior to the sale, the BLM is required by law to notify the Governor, the head of the governing body of any political subdivision having zoning authority or other land use regulatory responsibility in the geographical area, and the head of any political subdivision having administrative or public service responsibility. The notice shall also be sent to other known interested parties of record, including, but not limited to, adjoining landowners and current or past land users. (This requirement of the regulation will be met concurrently with the publication of the Notice of Realty Action.)

If comments are received in response to the Notice of Realty Action, BLM will analyze the comments and either proceed with the sale, modify the sale or its terms and conditions, or cancel the process. If the sale were cancelled or its terms were modified, a second Notice of Realty Action would be published. Comments may be dismissed, subject to the right of appeal to the Interior Board of Land Appeals.

If the BLM decides to proceed with the sale, a Patent (deed) will be written upon receipt of payment and after all the above actions have been completed.

Section 203 of FLPMA requires that when lands are sold, the conveyance document shall contain a reservation of all minerals to the United States. If the state wants to acquire the mineral estate, it can file a second application, under Section 209 of FLPMA. The Secretary of the Interior can convey the mineral interests if there are no known minerals values, or the record surface owner can demonstrate that development of the minerals would significantly interfere with the surface use, and that the nonmineral development would be a more beneficial use of the land than its mineral development.

SECTION 2

ALTERNATIVES

BACKGROUND: SITE SELECTION

The ADHS first began investigating potential sites for a hazardous waste facility in the late 1970s. The department's first efforts to propose a specific site met with considerable public opposition. In response to this, the Arizona State Legislature enacted Senate Bill 1283 (ARS Sec. 36-2800), which became effective in July 1980. In this law, the Legislature assumed responsibility for making the final decision on a facility site, based on ADHS's recommendation.

The current process of selecting a hazardous waste disposal site began in August 1980. An ADHS interdisciplinary task force was established from representatives of the Division of Environmental Health Services. Technical advisors from other state agencies, institutions, and the Governor's Office provided expertise and policy guidance throughout the selection process.

ADHS's site evaluation process and its recommendations are described in the siting study (1). To select a potential site, ADHS developed a three-level screening mechanism. Level 1 screening, the first and most general level of evaluation, was based on the environmental criteria mandated by ARS Sec. 36-2802, and on institutional criteria provided by federal and state land management policies. The purpose of Level 1 screening was to eliminate unsuitable areas of the state. As the criteria were applied and lands were rejected, 23 potentially suitable areas were identified.

Level 2 screening provided a more detailed assessment of the potentially suitable areas identified in Level 1. Twelve of the 23 areas were eliminated from further consideration. The 11 remaining areas were then subjected to an intensive economic, social, institutional, and environmental evaluation. The criteria included costs of land acquisition, facility development and operation, and transportation; health and safety impacts from transportation and facility operation; nuisances to nearby communities; scenic or aesthetic impacts; archaeological or historical impacts; surrounding land and water uses; land ownership; depth to ground water; quality of ground water; annual precipitation and evaporation; wind impacts; soil characteristics; biological communities; and presence of threatened or endangered plant or animal species.

Details of ADHS's site selection process are described in the siting report (1). After publishing a draft report, and conducting public hearings on December 4, 5, and 8, 1980, ADHS recommended to the Legislature the Western Harquahala Plain as the location for the state hazardous waste management facility. It also noted that the Mobile (Rainbow Valley) and Ranegras Plain sites were worthy of strong consideration. Reasons for the ADHS recommendations, as well as for elimination of the eight other sites, are given in the siting report. The Legislature designated the Mobile site as the location for the state's hazardous waste management facility in Senate Bill 1033 (February 1981). This Bill was codified into law as ARS Sec. 36-2802, Subsec. 3, and became effective in March 1981. It should be noted that sale of a site other than the Mobile site would require a change in the law to allow ADHS to make the purchase.

SITE ALTERNATIVES

Proposed Site - Mobile

The Mobile site consists of 1 square mile of land (640 acres) located in Maricopa County (legal description: Section 32, Township 4 South, Range 1 West of Gila and Salt River Base and Meridian) (Figure 2-1). In addition, there would be a 0.5-mile buffer zone of federal lands around the facility that would be managed cooperatively by ADHS and BLM. The buffer zone would continue to be used for grazing or for another use compatible with the facility.

The unincorporated community of Mobile is approximately 6 miles east of the site. There is currently no public access to the site. The nearest paved road ends just outside Maricopa, more than 15 miles from the site. A graded dirt road (Maricopa-Gila Bend) comes within approximately 1 mile of the site. Access from the east or west is from the Maricopa-Gila Bend Road. From Phoenix or Tucson, access would be from I-10 to Maricopa via county roads from Casa Grande or from the Gila River Indian Reservation. Access from the north is from Highway 80 east of Buckeye, or from I-10 at Jackrabbit Road, to the community of Rainbow Valley, and then via public roads to the Maricopa-Gila Bend Road. The Southern Pacific Railroad line crosses the area south of the site and parallels Maricopa Road in a general southwest-northeast direction.

Alternative Site - Western Harquahala Plain

The Western Harquahala Plain site consists of 2 square miles of land in east-central Yuma County.* It is bordered on the southeast by the Eagletail Mountains and on the southwest by Ranegras Plain (legal description: Section 25, Township 3 North,

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* Effective January 1, 1983, the Western Harquahala Plain and Ranegras Plain sites will be in the newly formed La Paz County.

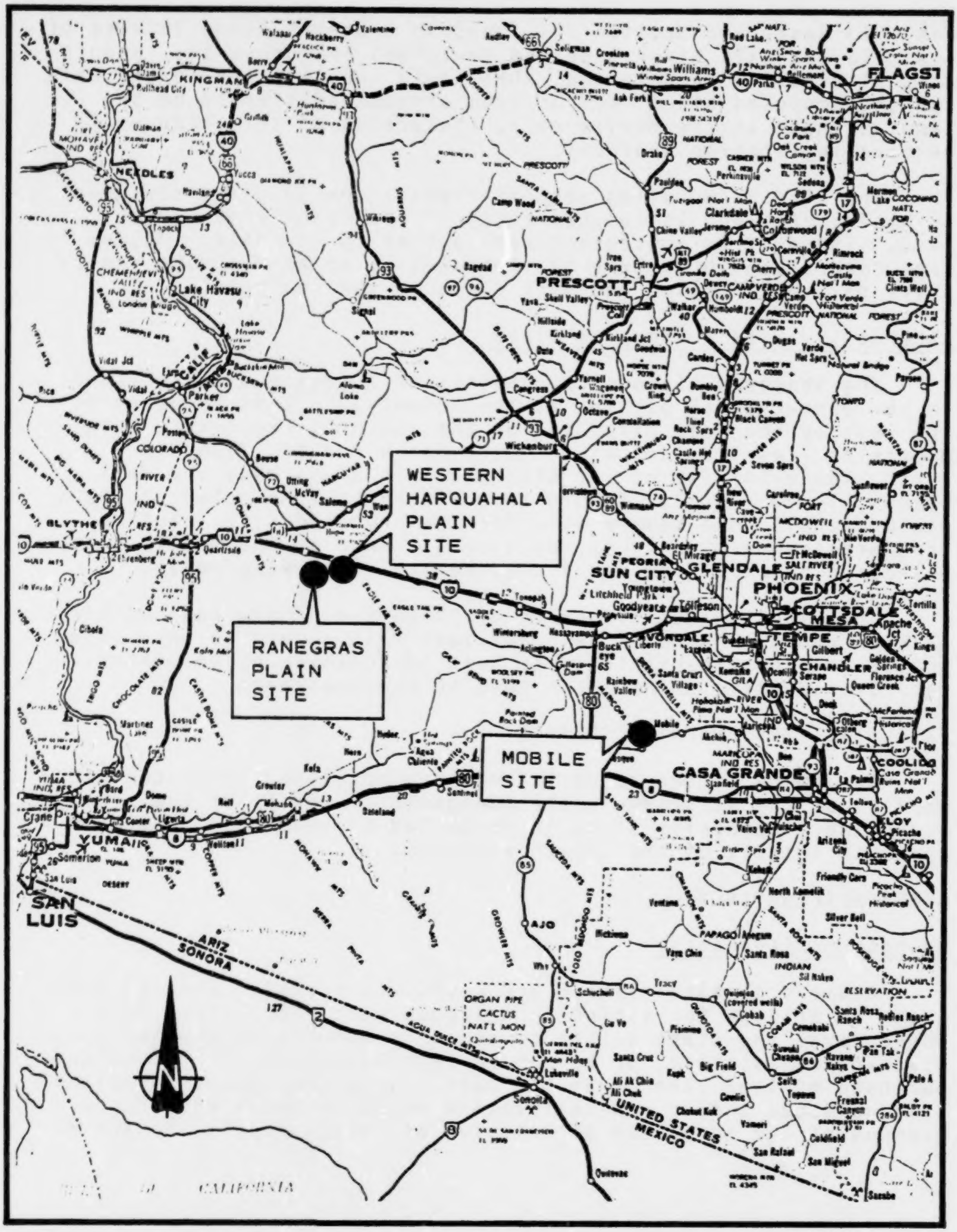
WESTERN HARQUAHALA PLAIN SITE
RANEGRAS PLAIN SITE
MOBILE SITE
KINGMAN
NEEDLES
PRESCOTT
FLAGST
BLYTHE
SUN CITY
GLENDALE
PHOENIX
SCOTTSDALE
MESA
TEMPE
CHANDLER
CASA GRANDE
COOLIDGE
YUMA
SAN LUIS
AJO
ELOY
ARIZ
SONORA
UNITED STATES
MEXICO
CALIFORNIA
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Figure 2-1. Locations of the proposed and two alternative sites.

Range 13 West, and Section 30, Township 3 North, Range 12 West of the Gila and Salt River Base and Meridian) (Figure 2-1). Should this alternative be selected, ADHS would identify one square mile for the proposed site. Buffer zone arrangements would be the same as those at the Mobile site. Selection of this site would require legislative approval.

The site is 90 miles west of Phoenix and 50 miles southwest of Wickenburg, and is located south of the 56-mile marker on I-10. There is no convenient rail access to the site. Access is from Interstate 10 at Exit 53, followed by an approximate 5-mile drive on public gravel and dirt roads to the southeast.

Alternative Site - Ranegras Plain

The Ranegras Plain site consists of 2 square miles of land in the east-central portion of Yuma County.* It is bordered on the west by the Bear Hills and on the south by the Little Horn Mountains (legal description: Sections 9 and 10, Township 2 North, Range 14 West of the Gila and Salt River Base and Meridian) (Figure 2-1). Should this alternative be selected, ADHS would identify one square mile for the proposed site. Buffer zone arrangements would be the same as those at the Mobile site. Selection of this site would require legislative approval.

The site is 100 miles west of Phoenix and 60 miles southwest of Wickenburg. There is no convenient rail access to this site. Access is from Interstate 10 at Exit 53 followed by an approximate 6-mile drive on Hovatter Road to the southwest.

POTENTIAL ENVIRONMENTAL IMPACTS

A summary of the potential environmental and socioeconomic impacts of the hazardous waste management facility at the proposed and alternative sites is presented in Table 2-1. Section 4 presents details of the impact analysis.

OTHER ALTERNATIVES

No-Action Alternative

Under this alternative, BLM would not transfer land to the State of Arizona for siting a hazardous waste facility. This would cause the state either to stop its efforts to develop a state-owned facility, or to obtain legislative approval for the purchase of land other than BLM land. In either case, legislative guidance and/or new legislation would be required. Consequences of the no-action alternative are discussed in Section 4.

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* Effective January 1, 1983, the Western Harquahala Plain and Ranegras Plain sites will be in the newly formed La Paz County.

Alternatives Eliminated from Detailed Study

Additional Alternative Sites--

Of the 11 sites remaining after Level 2 screening, only three were recommended for the proposed hazardous waste management facility. Reasons for elimination of the eight other sites are given in the state's siting report (1).

Recovery/Recycling Alternative--

ADHS intends to have the facility contractor practice recovery/recycling of hazardous wastes to the maximum extent practical. However, recovery/recycling of all wastes generated in Arizona does not appear to be viable at this time.

The potential for recycling or recovering certain constituents (e.g., metals, organic solvents) from hazardous wastes is dependent on the waste stream and associated costs and technology. An assessment of the quality and characteristics of the hazardous waste streams indicates that waste solvents would probably be the only waste stream for which recovery would be cost-effective.

For waste recovery to be cost-effective, several criteria must be met:

- The desirable fraction of the waste must be present in sufficient quantities to offset the costs of recovery. This is a function of concentration, the value of the recoverable product, and the operational costs incurred.
- Readily implementable technology for the recovery of the desired product must be available. There exist laboratory or theoretical recovery methods for virtually any material; however, many are impractical or prohibitively expensive when considered as full-scale systems.
- There must be a market for the recovered material.

Reuse of contaminated or dilute pesticides is not permitted. Many pesticide containers are not amenable to detoxification and reuse. For such wastes, secure disposal is the only alternative.

Many non-solvents may include relatively pure, outdated chemicals, or chemicals with a sufficiently high concentration of valuable components to be reused. However, it is difficult to discuss the technology or economics of reclaiming these materials due to the variety of chemicals and different reclamation techniques involved. For example, completely different equipment and technology would be needed to purify contaminated arsenic compounds, cyanide solids, trichlorofluoromethane, and carbon disulfide. It is not possible to generalize reclamation schemes for such a diverse waste stream. Further, it would be inappropriate to assume that these wastes could be reclaimed without more detailed knowledge of the condition of these wastes and the degree of contamination.

Some research has addressed the potential development of methods for recovering metals from inorganic sludges and fly ash, but none of these methods has been implemented on a large scale to date. For an inorganic sludge, the recovery process involves sludge dewatering, sulfuric acid leaching (possible use for waste sulfuric acids), filtration, dilution, ion exchange, and a series of precipitation/filtration processes with precise pH control. Metal salts, which are produced by this process, could be sold to a purification plant. They could undergo further purification for resale as processed chemicals. However, at current metal prices, electrolytic recovery of the actual metal is prohibitively expensive. The profit potential of this recovery process is dependent on the implementation of a technologically feasible recovery method, as well as the value of the metals at any given time.

Acids and bases are potentially reusable. Reuse would require storage at a hazardous waste facility for each discrete, possibly reusable acid or base waste for potential future as-is resale. In addition, separate evaporation basins would be needed to store unusable acids and bases. Such extensive storage requirements would be very expensive. Further, recovery of acids and bases at the facility would require the use of purification equipment.

Use of a single neutralization/evaporation basin for all corrosive wastes simplifies recordkeeping and is generally less costly than monitoring a number of separate storage facilities for discrete acids and bases. To begin with, an acid/base recovery facility would require the construction of storage tanks. Sizing the facilities becomes a problem in the absence of detailed data on the exact types and quantities of corrosives, as well as the potentially recoverable fractions. Whereas total quantity and evaporation rate data are sufficient to design an evaporation system, storage tanks would have to be overdesigned to handle any unsold corrosives, leading to unused capacity.

Depending on the requirements of potential customers, purification might be required. This could range from simple sedimentation (creating a sludge problem in the tanks) to concentration/dilution, to complete distillation/reconstitutions. At this level of treatment, recovered acids cease to be cost-competitive. The cost difference between simple evaporation and recovery can be as high as two orders of magnitude, depending on the level of treatment which might be required.

In summary, with the exception of waste solvents, all other wastes were excluded from consideration for potential recovery for the following reasons:

- Prohibitively high costs associated with lack of readily available technology for the recovery of identified materials.
- Low recoverability potential.
- Lack of sufficient data on some waste characteristics.

TABLE 2-1. SUMMARY OF POTENTIAL IMPACTS

Mobile Site	Western Harquahala Site	Ranegras Site
PHYSICAL SETTING		
Topography over an area of 58 acres would be substantially altered locally by the construction of the facility and access roads. Soils would be disturbed or removed. If erosion is not prevented, this could result in increased wind and water erosion due to the considerable disturbance of the site's natural vegetation. Following the construction phase, some of the disturbed land would likely revert to the preconstruction conditions over a period of years.	Same as Mobile Site alternative.	Same as Mobile Site alternative.
WATER RESOURCES		
The possibility of contaminants from the facility leaking or leaching into ground water is remote given the estimated ground water depth of at least 500 feet. Should ground water become contaminated, regional hydrogeologic data indicate that it would take 270 to 370 years for the contaminated ground water to move from the site to the nearest existing water supply wells.	Because of the estimated depth to ground water of 340 to 390 feet the possibility of leaking or leaching contaminants reaching the water table is remote. Regional hydrogeologic data indicate that it would take 2,700 to 11,000 years for contaminated ground water to move from the facility to the nearest existing water supply wells.	Because of the estimated depth to ground water of 320 to 390 feet, the possibility of leaking or leaching contaminants reaching the water table is remote. Regional hydrogeologic data indicate it would take 2,250 to 6,750 years for contaminated ground water to move from the facility to the nearest existing water supply wells.

TABLE 2-1 (continued)

Mobile Site	Western Harquahala Site	Ranegras Site
If the facility were not adequately designed to withstand flooding from intense storms, run off from the surrounding watershed could flood the facility and carry contaminants into Waterman Wash. A public health problem could result, although contaminant levels downstream would be reduced by dilution. Diversion of storm waters around the facility as a flood protection method could affect drainage patterns around the site; the flow of storm water into Northwest Tank could increase.	Since the site area is subject to sheet flow rather than concentrated flooding, the potential for flooding of the facility is lower at this site than at the Mobile site. Overflow from a nearby portion of the CAP canal due to an intense storm however could flood the facility and carry contaminants into Bouse Wash. A public health problem could result, although contaminant levels downstream would be reduced by dilution. Because the CAP canal has been designed to avoid or control overflow problems, such an event is unlikely.	Since the site area is subject to sheet flow rather than concentrated flooding, the potential for flooding of the facility is low.
AIR QUALITY		
Emission of TSP (e.g., dust, dirt) from construction activity would be expected to add an estimated 10 ug/m^3 to the ambient concentrations, exacerbating occasional TSP problems from natural sources (e.g., dust storms). Volatile organic compoundemissions from facility operations could exceed 300 tons/year, making the facility subject to Prevention of Significant Deterioration (PSD) review if the emissions were determined to be	Same as Mobile Site alternative.	Same as Mobile Site alternative.

TABLE 2-1 (continued)

Mobile Site	Western Harquahala Site	Ranegras Site
"non-fugitive." Based on the limited information available for this analysis, the levels of hazardous pollutants emitted into the air from facility operations would not be expected to be significant.		
PUBLIC HEALTH AND SAFETY		
Experience at existing hazardous waste facilities suggests that 0.5 operational spills per year could be expected at the proposed facility. Impacts of a spill would depend on the type of waste, weather conditions, etc. Volatilization of spilled wastes could potentially emit hazardous constituents into the air.	Same as Mobile Site alternative.	Same as Mobile Site alternative.
Transportation risk assessment shows that the potential for accidents is low (0.01 to 0.02 accidents per year) along three alternative routes from Tucson to the site. Accident probabilities for routes from Phoenix to the site may range from 0.02 to 0.13 accidents per year.	Transportation data shows that about 0.05 accidents per year can be expected from shipping wastes from Tucson to the Harquahala Site. Accident probabilities from Phoenix to this site (via I-10) are 0.16 to 0.18 accidents per year.	Same as Western Harquahala Site alternative.
Shipment of wastes from Phoenix and Tucson poses risks to populations residing along potential routes and near the proposed facility. Population at risk from Tucson to the site would range from 55,350 to 55,550	The population at risk is estimated at approximately 60,000 and 103,000, respectively, for hazardous waste shipment from Tucson and Phoenix to the site. The potential for	Same as Western Harquahala Site alternative.

TABLE 2-1 (continued)

Mobile Site	Western Harquahala Site	Ranegras Site
(depending on the route) while the Phoenix-site route would place from 104,000 to 133,000 at risk. Schools located in the Maricopa and Mobile areas may be considered as special cases of population at risk.	spills into the CAP Canal presents a special hazard. However, a probability of such a spill is extremely low, because the trucks are in the area for a very short time.	
Fourteen communities, three of which are near the site, could be exposed to hazardous material emergencies; thirteen communities could be affected by a transit emergency. Phoenix and Casa Grande are likely to experience more transit emergencies than other cities.	Twenty communities, seven of which are near the site, could be exposed to hazardous materials emergencies; 20 comunities could be affected by a transit emergency.	Same as Western Harquahala Site alternanative.
None of the nearby communities and virtually none of the nonmetropolitan communities have adequate emergency personnel, equipment, and communication equipment to respond to such emergencies. Phoenix could become overburdened if called upon to serve the facility in addition to its present responsibilities.	Same as Mobile Site alternative.	Same as Mobile Site alternative.
Soil disturbance may pose a risk of Valley Fever to those construction workers who have not previously been exposed. The probability of significant impacts on persons outside the site is low. Occasional high winds could disperse	It is assumed that the Valley Fever spore population at this site is similar to that at the Mobile Site. The population subject to possible exposure is lower than at the Mobile site.	Same as Western Harquahala Site.

TABLE 2-1 (continued)

Mobile Site	Western Harquahala Site	Ranegras Site
spores to nearby populated areas. Even under these conditions, the spread of Valley Fever would be low since immunity is presumed to have been built up in most area residents.		
Since the proposed site is located in a rural area with low population density odors are not expected to be a major problem.	Same as Mobile Site alternative.	Same as Mobile Site alternative.
Operational noise levels at the facility would be considerably above background levels, but the general noise level would not be expected to exceed OSHA standards. Facility operational noise would not be expected to affect nearby communities.	Same as Mobile Site alternative.	Same as Mobile Site alternative.
Noise from truck traffic through or near Mobile and Maricopa may be a nuisance.	No transportation noise impacts would be expected, as there are no permanent residences along the main access roads. Facility truck traffic would be an insignificant addition to traffic on I-10.	Same as for Western Harquahala Site alternative.
ECOLOGICAL RESOURCES		
Construction will result in loss of vegetation and disturbance of land. Food, shelter, and nesting habitats for local wildlife may also be removed.	Same as Mobile Site alternative.	Same as Mobile Site alternative.

TABLE 2-1 (continued)

Mobile Site	Western Harquahala Site	Ranegras Site
Some direct animal kills might occur. The operation of evaporation ponds may pose a threat to the avian population attracted to the ponds as a source of water. Over a period of time, the bioaccumulation of hazardous substances may increase the number of bird deaths due to poisoning, as well as affect their birthrates.		
LAND USE		
No significant impacts on land use would be expected as a result of the removal or loss of 58 to 640 acres for livestock grazing purposes from the existing BLM grazing allotment. Only a minor impact on the recreational resources could result. Some of the uses, such as grazing, may reoccur after facility has been fully closed, depending on the conditions of the permit.	Same as Mobile Site alternative.	Same as Mobile Site alternative.
VISUAL RESOURCES		
The facility would stand in significant contrast to the existing visual environment. The impact would be low because of the relatively small number of recreational users of the areas, and its distance from populated centers.	While the facility would be visible from I-10, the existing topography and presence of other currently visible structures (CAP Canal, pipeline pumping station, transmission line, I-10) would reduce the visual impact of the proposed facility.	The visual contrasts of the facility could be significant to users of the Kofa Game Range and a Wilderness Study area. However, existing visual disturbances (transmission line, windmill pump and water tank, and I-10) would lessen the overall impact of the facility on the visual experiences.

TABLE 2-1 (continued)

Mobile Site	Western Harquahala Site	Ranegras Site
CULTURAL RESOURCES		
No recorded archeological, historical, or significant Native American resources have been identified at the site, therefore no impact is anticipated. The facility would be expected to eliminate the gathering of subsistence plants by Native Americans on the site. Given the small area of the affected land, this impact would not likely be significant.	Same as Mobile Site alternative.	Same as Mobile Site alternative.
SOCIOECONOMICS		
Economic/demographic effects would be minimal; increased revenue flow to regional and local jurisdictions: generation of sales tax revenue during construction period from purchase of construction materials locally and tax revenue from out-of-state purchases. Because of conflicting impacts on land values, it is not possible to project the net impacts on land values. Odors, traffic noise, and anxiety with respect to other possible public health and safety effects could cause deterioration in the quality of life to a small number of people.	Same as Mobile Site alternative.	Same as Mobile Site alternative.

SECTION 3

AFFECTED ENVIRONMENT

INTRODUCTION

This section describes the existing environment at the proposed site (Mobile) and at the two alternative sites (Western Harquahala Plain and Ranegras Plain). As required by Section 1502.15 of the NEPA regulations, this section is limited to a description of the resources and a discussion of those aspects which will help the reader to understand the impacts of the available alternatives.

APPROACH

The description of various resources in the affected environment for the proposed and alternative sites was primarily based on secondary sources of information. A cursory field reconnaissance was made for some resources (e.g., socioeconomics, visual resources). The approach included (a) review and interpretation of existing reports, previous studies, or maps within the general areas, (b) extrapolation of data from studies similar to the proposed facility, (c) personal contacts with federal, state, regional, and local governmental agencies and institutions, and (d) consultation with knowledgeable professionals.

MOBILE SITE

Physical Setting

The Mobile siting area, as defined in the initial ADHS siting study, is located in the Rainbow Valley, in south-central Arizona within the Basin and Range Physiographic Province, bounded on the north, south, and west by the Maricopa Mountains, and on the east by the Palo Verde and Estrella Ranges (2). The area extends northward from approximately 32°59'30" to 33°12'30" North Latitude (3, 4). The proposed site is located approximately 3 miles northeast of Estrella and 0.5 mile north of the Southern Pacific Railroad (Figure 3-1). The site is 1 mile square, and comprises Section 32, Township 4 South, Range 1 West.

Topography--

The Mobile area, located between the Maricopa, Estrella, and Palo Verde Ranges, is comprised primarily of valley fill deposits. The proposed site is situated on dissected fan deposits on the east side of the Maricopa Mountains, with gentle sloping

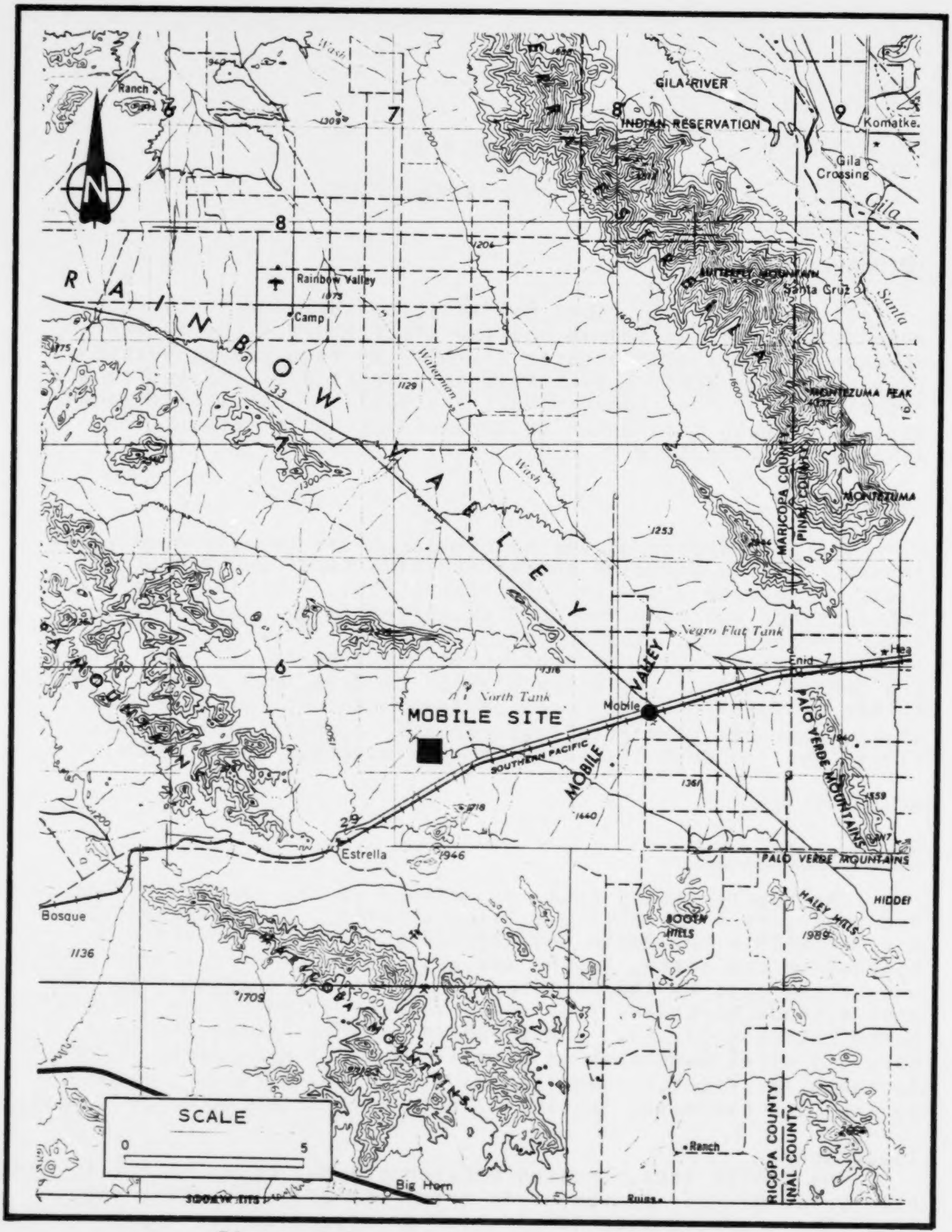
GILA RIVER
INDIAN RESERVATION
Komatke
Gila Crossing
Gila
Ranch
RAINBOW VALLEY
Rainbow Valley
Camp
BUTTERFLY MOUNTAIN
Santa Cruz
Santa
MONTEZUMA PEAK
MONTEZUMA
MARICOPA COUNTY
PINAL COUNTY
Negro Flat Tank
Enid
North Tank
MOBILE SITE
Mobile
MOBILE VALLEY
SOUTHERN PACIFIC
PALO VERDE MOUNTAINS
HALEY HILLS
BOOTH HILLS
Estrella
Bosque
Big Horn
Ranch
Ruins
SCALE
0
5

Figure 3-1. Location of Mobile site.

(approximately 1 percent) toward the east and north. Elevation ranges from 1,390 to 1,440 feet above sea level.

Soils--

The U.S. Soil Conservation Service has prepared generalized soil maps for the proposed site and its vicinity, which identify the following soil associations (5):

- Gilman-Estrella-Avondale.
- Antho-Valencia.
- Rillito-Gunsight-Pinal.
- Laveen-Coolidge.
- Casa Grande-Harqua.
- Chirioni-Gachado-Rock.

All but the last soil association developed on alluvial sediments from source materials of widely varying lithologies. An interpretative summary of the pertinent generalized properties of these soils is presented in Table 3-1.

Soils at the proposed site were described as being of the Gilman-Estrella-Avondale Association, dry loam and clay loam soils in alluvium derived from the surrounding mountains, with a moderate hydrologic transmission rate (5).

The Arizona Department of Health Services analyzed soil samples from three 150-foot-deep soil borings at the proposed site (6). These samples were described as fine-grained silty to clayey sands with abundant clays. This description conforms to White's description of the upper 200 feet of the unsaturated zone (7).

Geologic Conditions--

The area surrounding the Mobile site, situated within the west prong of Waterman Wash, sub-basin of Mobile Valley, is a relatively flat plain which slopes inward from the encircling mountains and drains toward the northeast. The plain is composed of valley fill, fan, and alluvial sediment derived from the surrounding mountains. The mountains were formed as the result of Late Tertiary tectonic activity, thrust faulting, and folding; rocks of Precambrian Age (gneiss and granite) are exposed (8).

The basin contains deep deposits (on the order of 2,000 feet deep) of Late Tertiary and younger sediments, formed from erosion of the mountains. At several locations, low hills (likely the remnants of deeply eroded mountains) extend above the valley fill.

The proposed site is located in the southwest portion of the basin, and is traversed by tributaries of the west prong of Waterman Wash. The actual depth of the valley fill and the nature of the underlying basement rocks are unknown. The sediments

TABLE 3-1. PROPERTIES AND FEATURES OF THE SOILS IN THE VICINITY OF MOBILE SITE, MARICOPA COUNTY*

Major Soil Association	Parent Material	Slope (%)	Permeability (in/hr)	Available Water Capacity (in/60 in)	Shrink/Swell Potential	Soil pH
Gilman-Estrella-Avondale	Mixed acid + basic igneous rocks					
Gilman loam		0-1	0.6-2	9.6-10.8	Low	7.9-8.4
Estrella loam		0-1	0.6-2	10.3-11.5	Low-Mod	7.9-8.4
Avondale clay		0-1	0.2-0.6	9.5-11.0	Moderate	7.9-8.4
Antho-Valencia	Dominantly granitic					
Antho sandy loam		0-5	2-6	6.6-7.8	Low	7.9-8.4
Valencia sandy loam		0-1	2-6	8.3-9.5	Low-Mod	7.9-8.4
Rillito-Gunsight-Pinal	Dominantly granite-gneiss, schist, basalt, andesite, and limestone					
Rillito gravelly loam		0-5	0.6-2	6.5-7.5	Low	7.9-8.4
Gunsight gravelly loam		0-10	0.6-2	4.0-5.5	Low	7.9-8.4
Pinal gravelly loam		0-5	0.6-2	1.5-2.7	Low	7.9-8.4
Laveen-Coolidge	Mixed source material					
Laveen loam		0-1	0.6-2	8.5-9.5	Low	7.9-8.4
Coolidge sandy loam		0-1	2-6	6.0-7.5	Low	7.9-8.4
Casa Grande-Harqua						
Casa Grande sandy loam		0-1	0.06-0.2	8.5-11.5	Low	8.5-9.6
Harqua very gravelly clay loam		0-5	0.2-0.6	5.0-6.5	Low	7.9-9.6
Cherioni-Gachado-Rock	Granite-gneiss, basalt, and site, rhyolite, tuff, schist, and granite					
Cherioni gravelly very fine sandy loam		10-40	0.6-2	0.9-2	Low	7.9-8.4
Gachado very cobby loam		10-40	0.06-2	1.5-2.1	Low	7.9-8.4
Rock outcrop		10-80				

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* Source: Reference 5.

in the vicinity are usually divided into two distinct units, as follows (8, 9):

- Upper Unit - comprised of unconsolidated sediments ranging in texture from sandy clay to gravels; 800 to 1,000 feet thick. The top 200 feet is generally finer textured than the underlying material.
- Lower Unit - comprised of poorly to moderately consolidated, relatively coarse alluvial material; generally greater than 500 feet thick (may locally exceed 1,000 feet).

These units thin dramatically around the periphery of the basin, forming extensive areas of piedmont with relatively shallow bedrock. The contact between the valley fill and the crystalline rock of the mountains is abrupt.

The U.S. Bureau of Mines computer data bank on mineral resources does not identify any such resources either in the general area or at the proposed site (10). The presence or absence of faults in the alluvium and in the bedrock adjacent to and beneath the site cannot be determined on the basis of the available data.

Climate--

The climate of the Mobile site can be best described by data from the Gila Bend, Phoenix and Casa Grande meteorological stations which surround the site (11).

Temperature--Mean monthly temperatures for Casa Grande, Gila Bend, and Phoenix are presented in Table 3-2. These data show that mean temperatures range from about 50°F in January to above 90°F in July. The range of temperatures to be expected in any one day may also be quite large. In January, the mean daily low temperature is about 36°F with the mean daily high about 66°F. In July, the mean daily low is about 75°F with an afternoon high temperature averaging about 106°F.

Data from Phoenix indicate that the afternoon high temperatures reach above 90°F for 162 days out of the year, and that these days generally occur from May through October. Freezing temperatures are experienced on an average of 15 days per year in Phoenix, but this number should be higher in rural valleys such as the site area (14).

Precipitation--Mean precipitation data for the local stations are shown in Table 3-2. Annual average precipitation is estimated at 6 to 8 inches per year. May and June are the driest months, and rainfall peaks in August. All three local stations show a monthly total for August above 1 inch.

TABLE 3-2. TEMPERATURE, PRECIPITATION, AND EVAPOTRANSPIRATION AT SELECTED LOCATIONS*

	Normal Temperature (°F)			Total Precipitation (inches)			Potential Evapotranspiration (inches)			Actual Evapotranspiration (inches)		
Month	Casa Grande	Gila Bend	Phoenix	Casa Grande	Gila Bend	Phoenix	Casa Grande	Gila Bend	Phoenix	Casa Grande	Gila Bend	Phoenix
Jan	50.6	52.6	51.2	0.76	0.62	0.71	0.44	0.57	0.53	0.44	0.57	0.53
Feb	54.9	56.5	55.1	0.67	0.44	0.60	0.64	0.80	0.76	0.64	0.56	0.76
Mar	59.7	61.4	59.7	0.69	0.65	1.51	1.64	1.51	1.78	1.51	0.62	1.78
Apr	67.7	69.5	67.7	0.35	0.30	0.32	2.70	3.13	3.00	0.35	0.22	0.42
May	76.2	77.9	76.3	0.11	0.10	0.14	5.05	5.36	5.18	0.09	0.11	0.12
Jun	84.8	85.9	84.6	0.16	0.04	0.12	7.41	7.54	7.54	0.17	0.07	0.07
Jul	91.1	93.1	91.2	0.95	0.76	0.75	8.46	8.64	8.37	1.25	0.82	1.06
Aug	88.9	91.5	89.1	1.56	1.08	1.22	7.71	7.97	7.71	1.32	0.91	1.06
Sep	83.6	85.8	83.8	0.79	0.50	0.69	6.17	6.51	6.17	0.78	0.47	0.82
Oct	72.1	74.7	72.4	0.63	0.33	0.46	3.26	3.76	3.28	0.28	0.36	0.44
Nov	59.5	61.6	59.8	0.56	0.35	0.46	1.11	1.20	1.20	0.78	0.45	0.62
Dec	51.8	54.0	52.5	0.88	0.59	0.82	0.49	0.53	0.29	0.49	0.53	0.29
Annual	70.1	72.0	70.3	8.11	5.76	7.05	45.6	47.65	45.83	8.10	5.69	7.38

* Source: References 12 and 13.

The intensity of rainfall is as important as the monthly average precipitation data. Most of the heavier rainfall comes in the form of brief, intense cloudbursts, especially in the late summer. These showers may rapidly flood the smaller gullies and washes as well as lower portions of the valley floors. Phoenix data show that the maximum 24-hour rainfall experienced in 28 years was 3.07 inches. The data also indicate that 24-hour total precipitation may exceed one inch in any month of the year (14). Thunderstorms may be expected on 22 days per year, and are most frequent in July or August.

Insignificant quantities of snowfall are recorded in most years, averaging 0.2 inch. The snow, however, melts almost immediately on the desert plain (13).

Evapotranspiration--Evapotranspiration is the combined loss of water by evaporation from the soil surface and by transpiration from vegetation. Mean monthly potential and actual evapotranspiration data for the local stations are presented in Table 3-2. Annual actual evapotranspiration (6 to 8 inches) is very low compared to the potential evapotranspiration (45 to 48 inches), indicating that the site is extremely dry.

Wind--Wind patterns are difficult to determine, especially by interpolation between weather stations. Throughout these areas of complex terrain, wind patterns can also be quite complex. It is likely, however, that the vicinity of the proposed site will have a prevalent mountain-valley breeze system in which winds blow up the mountain slopes during the afternoon and down these same slopes during the night and early morning (14).

Mean wind speeds at Phoenix average 4.4 to 6.4 miles per hour (mph), and these same speeds should prevail at the site. The lowest mean wind speeds occur during the months of November through February. These winds are light, and periods of calm are frequent. Winds are predominantly from the east during the winter and fall.

Wind speeds in excess of 8 mph occur more frequently during spring and summer months, when westerly winds become prevalent. The highest mean wind speeds occur from April to July. The strongest gusts of wind recorded in the Phoenix area (86 mph) occurred in July of 1976, originating from the southeast. In June and August of 1978, winds from an easterly direction reached 72 and 78 mph, respectively. Peak gusts of wind are associated with the thunderstorms which move through the area. Gusts of 50 mph or more may be expected in any month. It is likely that in local, intense storms, wind gusts may reach 100 mph or more. During the thunderstorm season rapid changes in winds and temperatures may be expected along with brief intense showers.

Water Resources

Ground Water--

The principal aquifer in Rainbow Valley is composed of basin-fill and exists under water table conditions. The aquifer has been divided into an upper and a lower unit (14). The upper unit has a saturated thickness of 700 feet in the southwest part of the basin.

No ground water measurements have been made, as there are no wells at the proposed site. The closest well is 2-1/4 miles northeast (downgradient) of the site. This well has been abandoned, but moist sand has been detected at 480 feet beneath the surface (15). This information, along with measurements of depth to ground water in the vicinity of Mobile, leads to an estimated depth to ground water at the proposed site of at least 500 feet.

The ground water in the basin moves in a northerly direction toward a large cone of depression, an area in which heavy pumping of ground water has lowered the water table. This cone of depression, caused by agricultural pumpage, is located 12 to 15 miles north of the proposed site. The ground water velocity in the Mobile vicinity can be calculated using a transmissivity of 8,000 square feet per day, a saturated thickness value of 700 feet, an hydraulic gradient of 10 feet per mile, and a porosity of 8 percent (16). This calculation results in an estimated average ground water velocity of 0.27 feet per day, or 99 feet per year. The hydraulic gradient in the northwest part of the basin increases to 30 feet per mile. Using the same aquifer characteristics and the new hydraulic gradient, the estimated average ground water velocity near the cone of depression is 0.80 feet per day, or 290 feet per year.

In an environment as arid as that around Mobile, with an average annual precipitation of 8 inches (1), direct rainfall accounts for very little of the "recharge," or replenishment, of the ground water aquifer except in areas near mountain range fronts or stream beds (17, 18, 19, 20, 21). It appears, therefore, that the Mobile site is not in an area which is a significant source of ground water recharge. Further evidence that the ground water in the area of the Mobile site receives no direct recharge from precipitation is the report that the upper 150 feet of the unsaturated zone beneath the site contains less than 5 percent moisture content by weight (6).

Surface Water--

The only surface waters on or near the Mobile site are occasional storm waters which drain through the washes on and around the site, and water catchments or "tanks" for cattle. Tanks and major washes are shown on Figure 3-2.

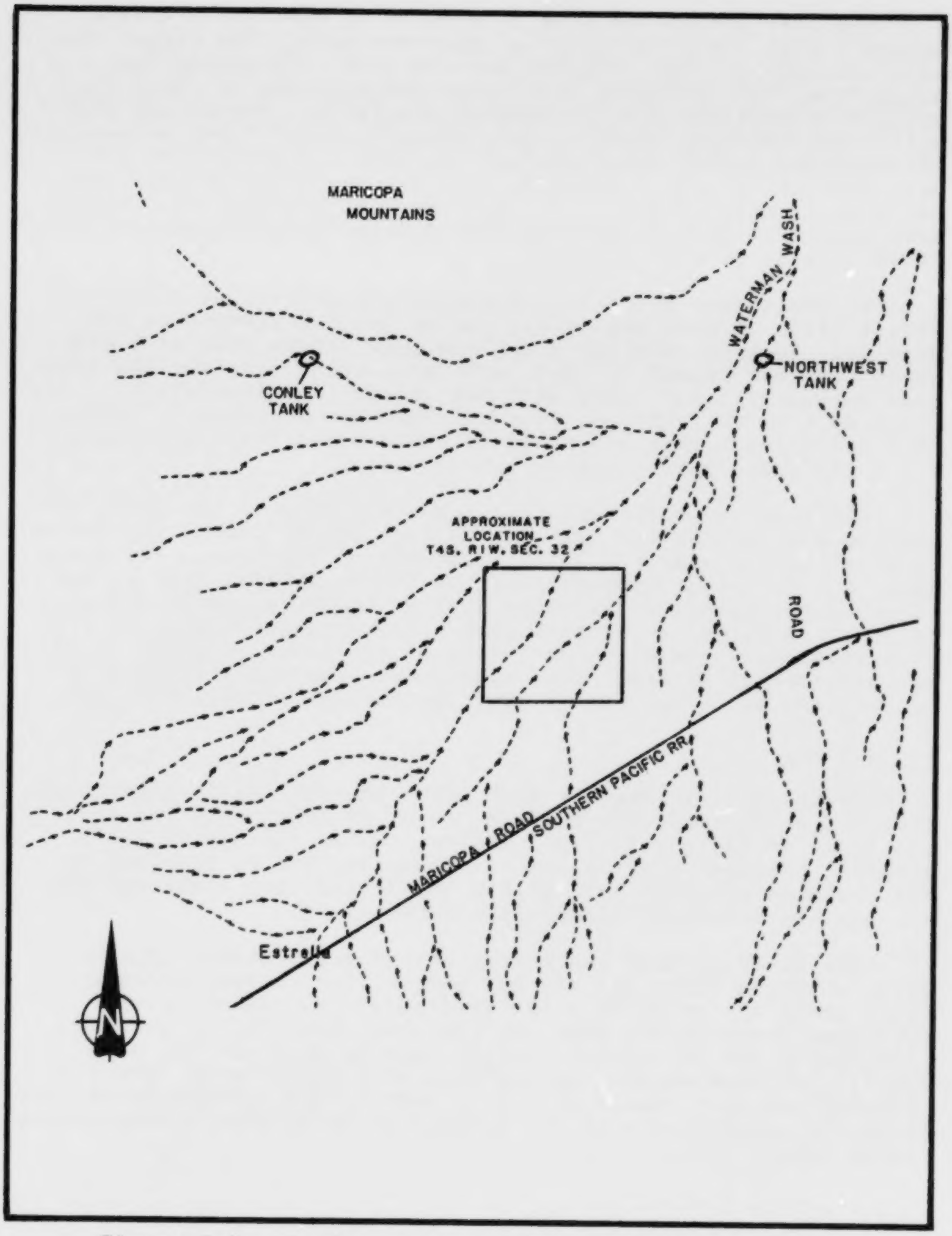
MARICOPA
MOUNTAINS
CONLEY
TANK
WATERMAN WASH
NORTHWEST
TANK
APPROXIMATE
LOCATION
T4S, R1W, SEC. 32
ROAD
SOUTHERN PACIFIC RR
MARICOPA ROAD
Estrella
N

Figure 3-2. Surface water drainage at Mobile site.

The area around the site is crossed by numerous drainage channels that are tributaries of Waterman Wash. The larger channels cut several feet into the surface soil, indicating that water from high-intensity rainstorms concentrates in these channels as it runs off the surrounding mountains. Three such channels cross the site itself. This suggests significant volumes of intermittent runoff flows through the site. There are no 100-year floodplain maps showing flood-prone areas at the site, but the area is classified by the Department of Housing and Urban Development as Zone D, meaning that undetermined but possible flood hazards exist.

Waterman Wash and its tributaries are subject to flash floods (22). A U.S. Geological Survey gauging station on the wash near Buckeye recorded a maximum peak stream flow of 6,300 cubic feet per second in 1967, with an average peak for the 1964-1980 period of 1,608 cubic feet per second (see Appendix F). The proposed site is within an 18.4-square-mile watershed for which ADHS estimates a peak discharge of 4,000 cubic feet per second for a 100-year, 2-hour precipitation event.

Although several tanks are in the vicinity of the site, all but one are outside the drainage pattern of the site. The Conley Tank is located nearly 2 miles northwest of the site. The North Tank is 7-3/4 miles northeast of the site. A third tank is located approximately 5-1/4 miles east of the site, while a fourth is nearly 3 miles to the southeast. The Northwest Tank, located approximately 1-3/4 miles northeast of the site, is close to the western fork of Waterman Wash downstream from the site, and could be affected by surface water draining through or near the site.

Air Quality

Background air quality data (from the air quality monitoring stations at Maricopa and Buckeye, about 25 miles from the site) are shown in Table 3-3 (23). Ambient concentrations of sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, and lead at the proposed site are well within the federal and state ambient air quality standards (AAQS) (see Appendix G).

The observed high concentrations of particulates (e.g., dust) noted in Table 3-3 are not unusual for central Arizona. Since there are relatively few artificial sources of total suspended particulates (TSP) in the area, high TSP values are principally due to natural causes, such as dust storms, dust devils, and high winds. An analysis of a 3-year wind record at Estrella Sailport showed that high particulate concentrations are primarily associated with the passage of convective thunderstorms and/or fronts (13).

TABLE 3-3. AMBIENT AIR QUALITY AT THE MOBILE SITE*

Pollutant	State/Federal AAQS† Primary	State/Federal AAQS† Secondary	Ambient Air Quality#	Monitoring Site(s)
Carbon Monoxide				
1-hour	40	40	3	Maricopa
8-hour	10	10	1	
Hydrocarbons				
3-hour (6-9 a.m.)	160	160	433	Maricopa
Lead				
Calendar Quarter	1.5	1.5	0.02-0.24	Buckeye, Maricopa
Nitrogen Dioxide				
Annual	100	100	7	Maricopa
Ozone				
1-hour (Daily Max.)	0.12	0.12	0.05-0.06	Buckeye, Maricopa
Particulates				
24-hour	260	150	142-343	Buckeye,
Annual	75	60	54-127	Maricopa
Sulfur Dioxide				
3-hour	--	1,300	31	Buckeye
24-hour	365	--	14	
Annual	80	--	2	

* Units are ug/m^3, except for carbon monoxide and ozone, which are in units of mg/m^3 and ppm, respectively.

† Ambient air quality standards.

# Maximum second high values for 1981, as provided by Olmstead (23). The ambient air quality data for ozone were taken from the 1980 Air Quality Data for Arizona (24).

Public Health and Safety

Spills--

The proposed site is located in a rural desert area with no current industrial activity. It is thus assumed that there are currently no hazardous material spill accidents at this site.

Risks from Transporting Hazardous Wastes--

The proposed site is located in a rural area with no industrial or disposal activity. It is thus assumed that there are presently little or no risks from transporting hazardous wastes in this area. A planned Provident Energy Company oil refinery (to be located near the Mobile School) may generate some shipments of hazardous wastes.

Emergency Response--

Public safety is evaluated in terms of the effectiveness of present response capabilities for both nearby communities and communities located along the major transit routes (see Figure 3-3). The traffic counts for 1980 on Exit No. 162 from I-10 total 20,000 cars per day; further down Maricopa Road to Maricopa, the count is 1,800 cars per day, and from Maricopa to Casa Grande, up to 18,000 cars per day. The traffic count on the Casa Grande exit off I-10 (Exit No. 194) is 14,000 cars per day.

The present traffic count along the Maricopa Highway to Mobile is 139 cars per day (25). It is estimated that this traffic count will increase an additional 300 to 600 cars per day when the Provident Refinery becomes operational. The current traffic count on the road from the community of Mobile past the Mobile site is 44 cars per day (25).

Site emergencies--There is presently no fire department in the Rainbow Valley area. The closest fire departments are all-volunteer units in Gila Bend and Maricopa, both about 18 miles from the Mobile site (Table 3-4). Since the Gila Bend department usually covers an area of 10 miles from the city, it is doubtful that they would be able to respond to a site emergency. The department provides minimal firefighting support; it is not prepared to handle incidents involving hazardous materials or medical emergencies. The volunteer fire department at Maricopa is even smaller. It is only minimally prepared to respond to medical emergencies or any incident involving hazardous materials (see Table 3-4).

The proposed Provident Energy Company oil refinery at Mobile is expected to have its own emergency response services. The extent to which these services could be available to assist with emergencies at the hazardous waste facility is not known at this time.

Transit emergencies--The three Arizona counties primarily affected by hazardous waste generation and transport to the proposed Mobile site are Maricopa, Pima, and Pinal. The degree to

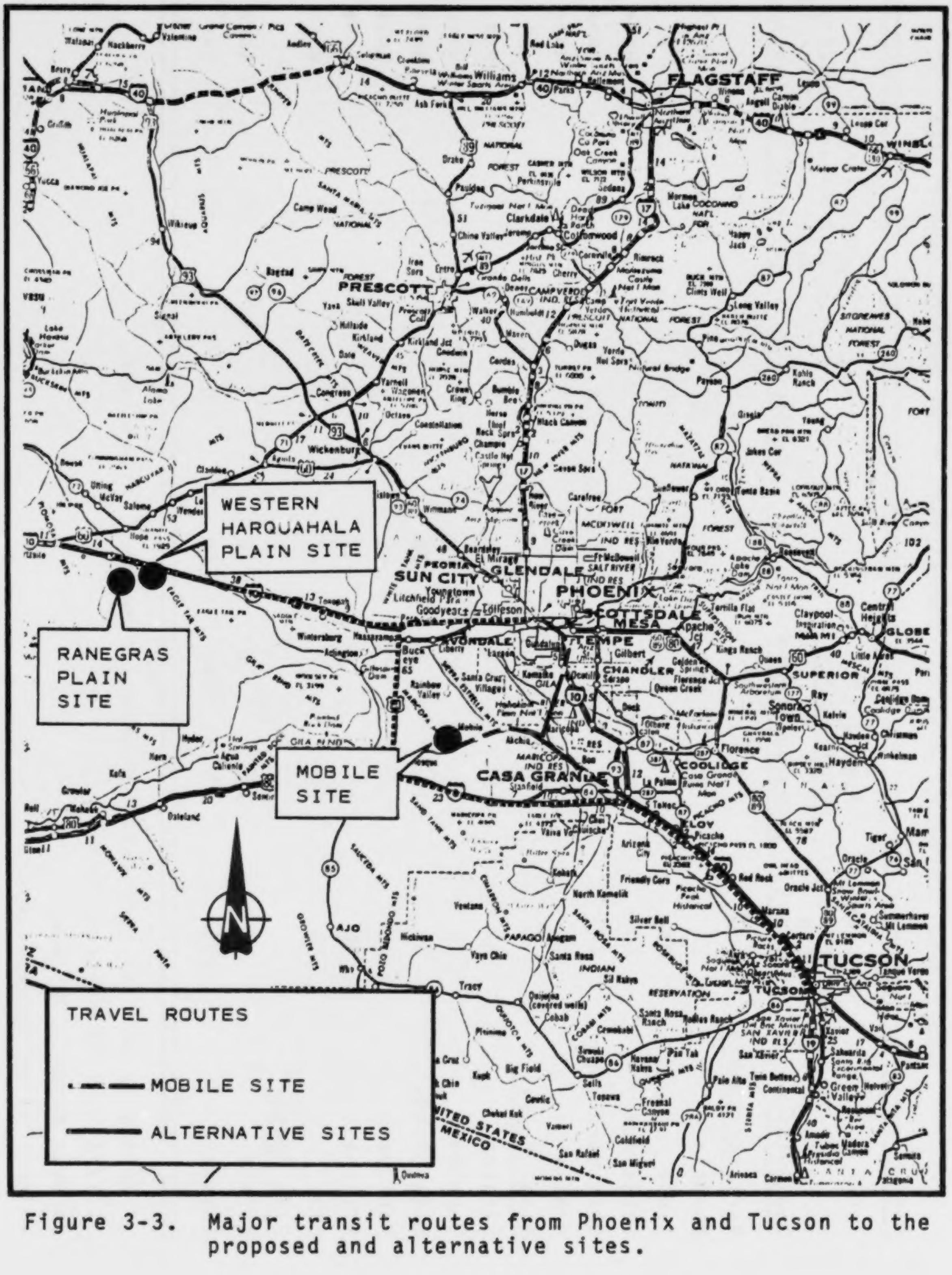
WESTERN HARQUAHALA PLAIN SITE
RANEGRAS PLAIN SITE
MOBILE SITE
TRAVEL ROUTES
MOBILE SITE
ALTERNATIVE SITES
FLAGSTAFF
Williams
PRESCOTT
Wickenburg
SUN CITY
GLENDALE
PHOENIX
SCOTTSDALE
MESA
TEMPE
AVONDALE
CHANDLER
SUPERIOR
GLOBE
CASA GRANDE
COOLIDGE
ELOY
TUCSON
AJO
UNITED STATES
MEXICO
N

Figure 3-3. Major transit routes from Phoenix and Tucson to the proposed and alternative sites.

TABLE 3-4. EMERGENCY RESPONSE CAPABILITY IN THE RAINBOW VALLEY AREA

Community	Distance from Site (miles)	Number of Firefighters		EMT's/ IMT's*	Paramedics	Number with Hazardous Materials Training	Hazardous Materials Equipment
		Volunteer	Paid				
Maricopa County							
Phoenix	52	0	800	800	100	800	Yes†
Tempe	46	0	111	111	18	10-15	#
Guadalupe	40	0	5	15	0	7	None
Gila Bend	12	25	0	2	0	0	None
Mobile	5	0	0	0	0	0	None
Pinal County							
Sacaton	54	8	0	0	0	1	None
Coolidge	60	0	28	16	0	14	None
Casa Grande	39	20	12	32	3	6	None
Maricopa	18	12	0	6	0	1	None
Arizona City	50	16	0	0	0	0	None
Eloy	54	17	1	1	0	0	None
Pima County							
Marana	21	38	0	0	0	5	None
Tucson	103	0	450	450	5	450	Yes**

* Emergency Medical Technicians/Instructor Medical Technicians.

† 33-member HM response team.

# Uses Phoenix HM team.

** Part of HM response team.

which each of these counties is prepared to respond to emergency situations is described below.

Maricopa County's Department of Civil Defense and Emergency Services has a formal emergency response plan for dealing with hazardous materials incidents ("Peacetime Disaster Plan, Annex G: Hazardous Materials Incidents") (26). The plan includes a definition of such incidents, a task-specific operations guide for the county agencies that could be involved, a specification of responsibility for on-site coordination, and a list of resource agencies for chemical and radiological incidents. While the department widely disseminated the plan by mail, the degree to which other agencies are aware of the plan is unknown. Similarly, it is also unknown whether county employees are aware of the presence or contents of the Hazardous Materials Pocket Guide, which the department has placed in every county vehicle.

The Mobile site is located within the jurisdiction of the Maricopa County Sheriff's substation at Gila Bend. This substation, located about 35 miles from the proposed site, is staffed with 13 officers and a supervisor. These officers have received no hazardous materials training.

Maricopa County has no hazardous materials response team as such, although the Phoenix Fire Department's Hazardous Response Unit is authorized by the Phoenix City Council to respond anywhere in the state upon a request from Arizona Department of Public Safety (DPS) or local jurisdictions.

Emergency services in Pima County are coordinated for the city of Tucson and the county by the same department. The main concern of this department would be responding to transit emergencies within the city of Tucson (a point of origin) or on I-10 within Pima County.

The State Division of Emergency Services developed a formal hazardous materials response plan in November 1979. A major component of the plan was the formation of the Tucson-Pima County Hazardous Materials Response Team. The team is equipped and trained primarily by the Division of Emergency Services. The team is an interagency group composed of members of the Tucson fire and police departments, the sheriff's office, DPS, and the city-county emergency services office. The team, either as a whole or in part (depending on the severity of the situation), is dispatched any time that a hazardous materials incident is identified. Upon request from a city, the team will also respond to an incident in a local jurisdiction.

The emergency services functions of Pinal County are incorporated in the County Administrator's office. Currently, Pinal County has no formal plan to respond to hazardous materials incidents, and no staff resources upon which to draw.

Several communities in the Phoenix and Tucson metropolitan areas are well equipped and trained to respond to hazardous materials incidents (Table 3-4). Other fire departments or districts consist wholly or primarily of volunteer firefighters who have little hazardous materials training and no specialized equipment.

Only Casa Grande appears to have emergency medical capabilities. Outside of one independent ambulance unit, the fire department in Casa Grande provides the only medical transportation vehicle in the area.

Valley Fever--

Valley Fever (Coccidioidomycosis) is a disease normally contracted by inhaling microorganisms (cocci arthrospores) that float freely in dust clouds (Appendix H). The disease usually occurs in a very mild form that resembles a bad cold. In about 30 to 40 percent of all Valley Fever cases, the patient becomes very ill. Some deaths have been attributed, at least in part, to the disease.

The fungus thrives in arid and semiarid regions. In Arizona, Valley Fever has occurred primarily in the arid southern half of the state. The pathogen is especially prevalent in the Phoenix and Tucson areas (27).

The Rainbow Valley area has been characterized as a potential source for recovering the fungus spores from soil samples (28). However, specific information on their concentration and density at the Mobile site is presently lacking.

Odor--

Baseline odor level information for the Mobile site is not available. Since this site is located in a rural desert area with low population density, it is assumed that the site is characterized by odors typical of rural desert areas, mainly from creosote bushes.

Noise--

Baseline noise level information for the Mobile site is not available. Since this site is located in a rural area with low population density, it is assumed that the site is characterized by low ambient noise levels, typically in the range of 40 to 45 decibels (29). The 10 to 15 trains per day which pass through the area on the Southern Pacific Railroad paralleling the Maricopa-Gila Bend Road, however, increase noise levels on an intermittent basis (30). Diesel locomotives, for example, can produce noise levels between 85 and 105 decibels at a distance of 50 feet (29).

Ecological Resources

Vegetation--

The site features a creosote-bursage community on a broad, flat plain. A detailed list of plant species that are common in the area is provided elsewhere (31). The dominant plant, creosote bush, may develop into near-pure stands, or may be in association with bursage. White bursage may be found in lower, drier areas, whereas the common bursage dominates in the upper or moister areas. These two species may comprise over 90 percent of the vegetational density in many areas (1).

No federally listed endangered or threatened species are known to occur on or near the Mobile site (13). No suitable habitat exists within the study area for any of the endangered plant species of Arizona. However, four plants of night-blooming cereus were reported at the Mobile site (13). This species is protected under the Arizona Native Plant Law, and is currently being considered as a candidate for federal listing as a threatened or endangered species.

Other protected native plants which may be impacted include the blue palo verde and the crucifixion thorn.

Wildlife--

The animals of the area are composed of distinct groups of species which occupy specific habitats. These animals are highly adapted to desert conditions, and are capable of surviving extreme temperatures and very low humidity.

A listing and detailed analysis of wildlife that may occur in the general area are provided elsewhere (31).

Amphibians and Reptiles--Amphibians which might be expected in the area are primarily limited to the Couche's spadefoot and the Great Plains toad. Reptiles within the area include tortoises, iguanas, snakes, lizards, and geckos. Two species which are listed as endangered by the Arizona Game and Fish Department are the desert tortoise and the Gila monster (14).

Birds--There may be more than 150 species of resident and transient birds in the vicinity (1). One endangered species, the peregrine falcon, may appear infrequently as a transient or winter visitor to the area, since this species occurs in a variety of habitats in Maricopa County.

Mammals--Rodents (e.g., kangaroo rats, pocket mice) are the most common mammals found in the area. They provide an important source of food for the numerous predators in the desert ecosystem. Predators (e.g., coyote, gray fox, kit fox) and "big game" animals are considered transient species, and may thus occur almost anywhere within the area. These species, along with bats, need to make periodic visits to sources of free water in order to survive. Consequently, these species are not normally common in areas that are very remote from free water. Several wildlife water catchments are currently maintained by the Arizona Game and Fish Department, primarily for the desert mule deer within the Maricopa Mountains (32). The nearest of these is 6 miles to the west of the Mobile site (1).

Of the "big game" animals, only bighorn sheep are likely to appear in the immediate vicinity. They generally concentrate in the higher mountainous terrain where adequate supplies of food and water exist year-round (14). The desert bighorn sheep and the spotted bat are listed as threatened and unique species by the Arizona Department of Game and Fish. The spotted bat is considered to be the rarest bat in the United States, and its occurrence is unpredictable (14).

Land Use

An area within 2 miles of the proposed site was delineated as the study area, based on the premise that 2 miles represents the maximum sphere of influence from a land use sensitivity perspective (see Appendix I for land use inventory).

Land Jurisdiction--

The entire study area is composed of BLM-managed public lands, with the exception of 80 acres of Arizona State Trust land in the northeast corner of the study area and 160 acres of private land located in the east-central portion (Figure 3-4). Subsurface mineral rights are held by the Arizona State Land Department (ASLD).

Existing Land Use--

The major recreational activities which occur in the study area are hunting and off-road vehicle use. Recreational use of the area is light to moderate, because of its distance from population centers, lack of available water, and extreme daytime summer temperatures (33).

Maricopa County Parks and Recreation Department has proposed an equestrian trail to cross the northern portion of the study area. The exact location of the proposed trail is uncertain, but it appears to follow what is presumed to be the Butterfield Stage Route about 1.5 miles north of the site (34). Informal or unorganized recreational activity also occurs on the Butterfield Stage Route. Numerous Boy Scout troops work on the stageline in this area to earn their historical badges. Interpretive signs erected mostly by the Boy Scouts currently mark portions of the trail.

A portion of one Wilderness Study Area (WSA) is located in the extreme southwestern portion of the study area (see Figure 3-5). Unit 2-164, Butterfield Stage Memorial, consists of 9,566 acres, and is located 15 miles east of Gila Bend. This area has a central core of rugged mountains that form the southern tip of the North Maricopas.

Lands in the study area administered by BLM and the State Land Department are predominantly undeveloped agriculturally, and are used largely by ranchers with BLM and State Land Department grazing permits and/or leases for livestock allotment. Nearly the entire study area is within the Conley grazing allotment. It

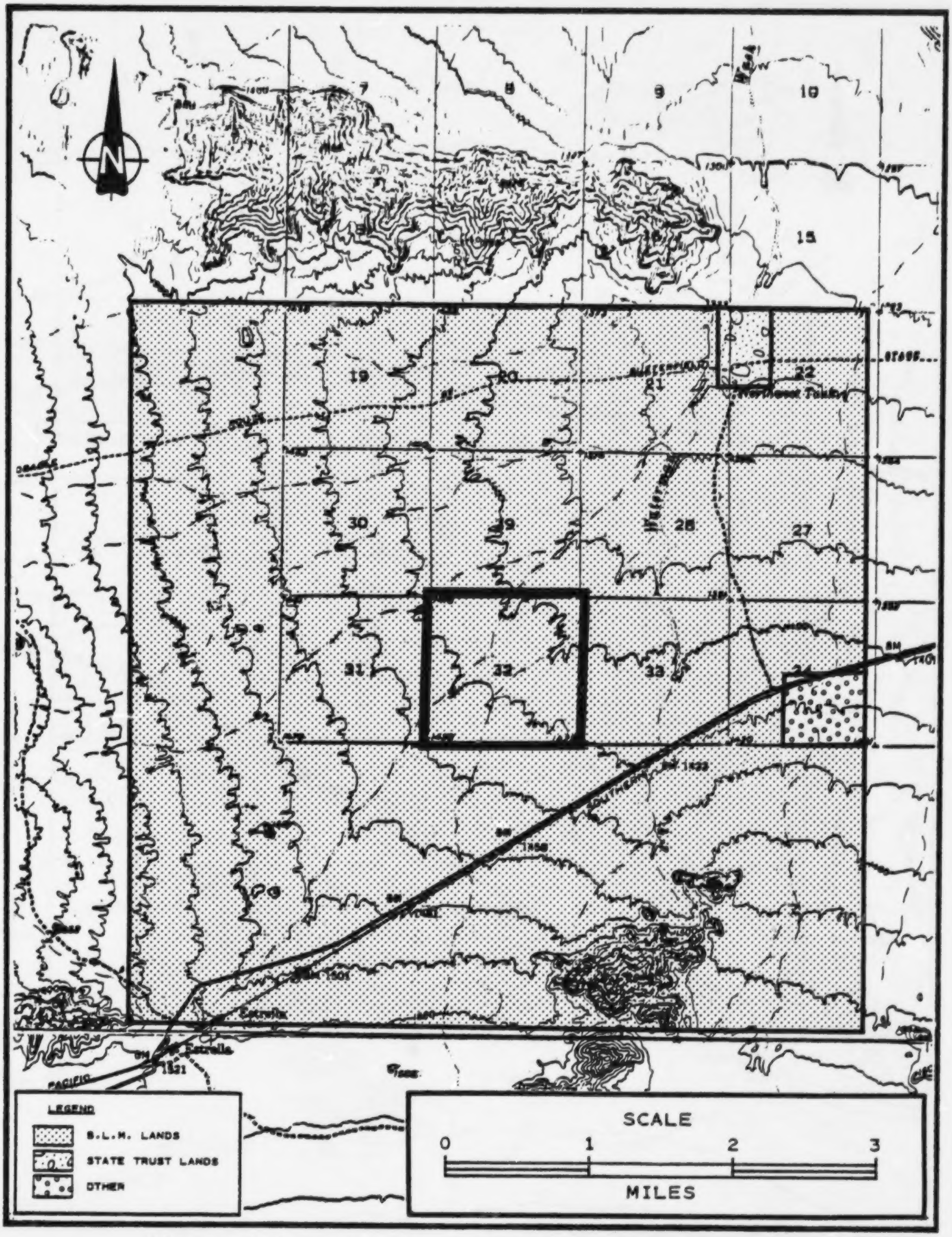
N
7
8
9
10
15
19
21
22
30
29
28
27
31
32
33
Estrella
PACIFIC
LEGEND
B.L.M. LANDS
STATE TRUST LANDS
OTHER
SCALE
0
1
2
3
MILES

Figure 3-4. Land jurisdiction at Mobile site.

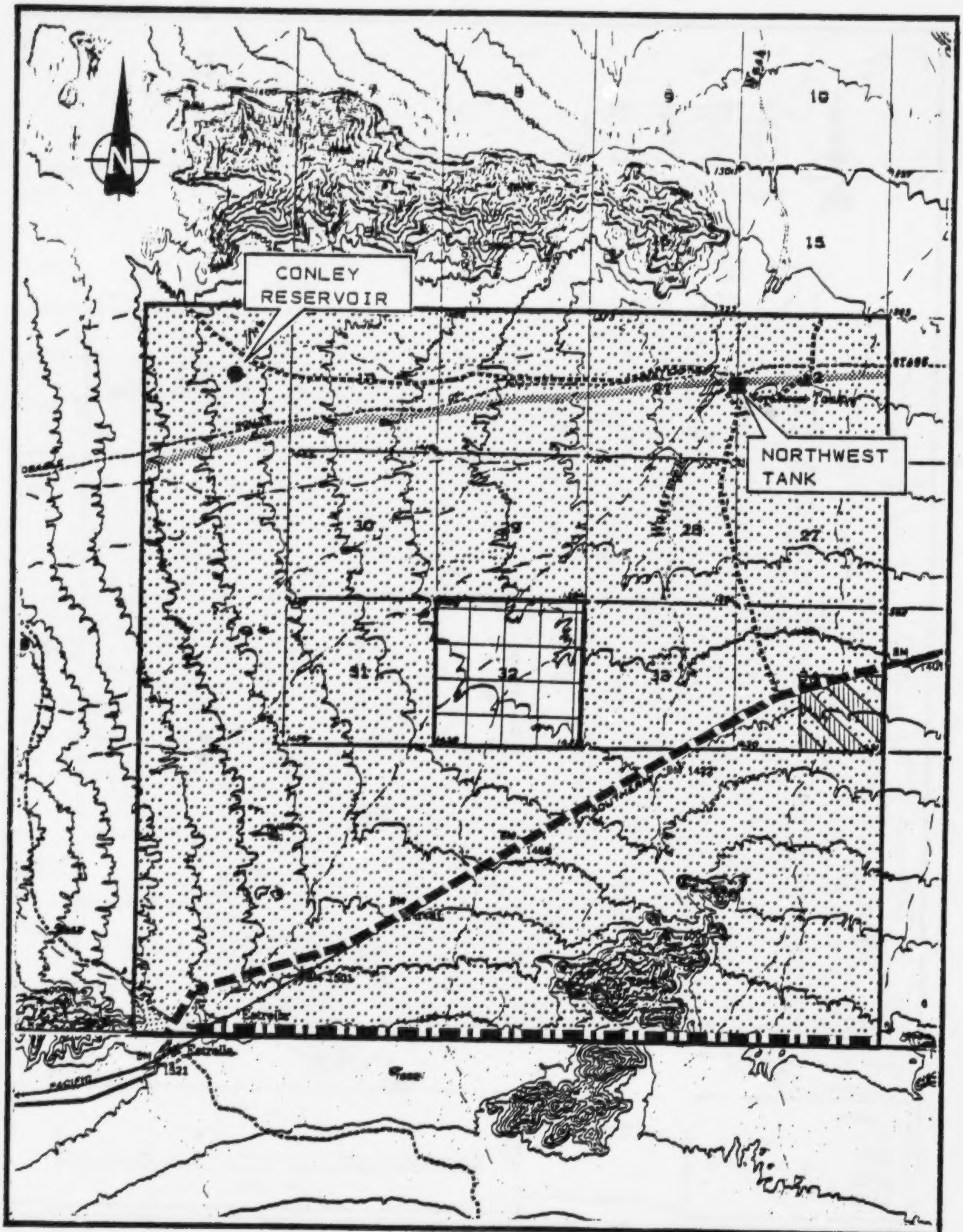
N
7
8
9
10
15
CONLEY RESERVOIR
NORTHWEST TANK
30
29
28
27
31
32
33

Figure 3-5. Existing land use at the Mobile site.

should be noted that the study area represents only a portion of the entire Conley allotment. The Conley allotment is managed as a perennial-ephemeral range, according to the provisions of 43 CFR 4110, with the following qualifications:

- Season of use: year long.
- Class of livestock: cattle and horses.
- Base herd qualifications: 4,158 Animal Unit Months (AUM's)*, the equivalent of 350 cows year long. This base herd qualification was determined using a figure of 99 percent federal range.

The existing range improvements within the study area are the Conley reservoir and the northwest tank. These are displayed on Figure 3-5. Neither is on the site itself.

Arizona Public Service (APS) is proposing to construct a 230-kV transmission line between the existing Santa Rosa Substation, 7.5 miles southeast of Maricopa, and the Gila Bend Substation, approximately 1 mile west of Gila Bend.

The Southern Pacific Railroad operates a main line which crosses the southern portion of the study area, and parallels Maricopa Road in a general southwest-northeast direction. Maricopa Road, a graded dirt road, runs northeast from Gila Bend to Maricopa. Unimproved dirt roads within the study area primarily provide access to range improvements.

Future Land Use--

The Maricopa Association of Government (MAG) regional development plan designates the study area's future land use as "general rural." Such areas are considered urban reserves because development is not anticipated until after the year 2000. Premature extension of metropolitan services to these areas is discouraged, although some residential development could occur on scattered estates (35).

Maricopa County does not have an adopted comprehensive or general plan. However, their unadopted report for future general land use was apparently used to develop MAG's regional plan. Therefore, goals, objectives, and policies concerning land use in Maricopa County may be understood to be similar to those of MAG (36, 37).

The ASLD is the only governmental agency with the possibility of future development in or near the study area. This agency is concerned with the agricultural, urban, or commercial development of state lands. It is also the agency responsible for

* AUM is the amount of forage required to sustain one cow with one calf, or their equivalent, for 1 month.

selecting federal land for transfer to the state under an ongoing program of land transfer between BLM and the state.

A remote possibility exists for selection of federal lands around Mobile as part of this program. The proposed Provident Energy Company oil refinery, south of Mobile, might stimulate development of agglomerative industries (i.e., any type of industry which would benefit from a location near the refinery either in terms of supplying some type of raw material to the refinery, or one which would aid in the production and distribution of products). If this industrial expansion were to occur, the state might show some interest in acquiring land in the area. It should be noted that the Governor's Task Force on In-Lieu Selection of Federal Lands has established guidelines and criteria to guide the decision makers in selecting the best of the remaining federal land due to the state. Selection of federal lands in the Mobile area would not follow these criteria (13, 37, 38, 39, 40).

Future land uses are projected by BLM to be essentially the same as at present (livestock grazing) (41, 42, 43).

Present possible land uses are directly related to zoning. The 160 acres of private land which is under Maricopa County jurisdiction has been classified into the Rural Zoning District (Rural - 190) - 190,000 square feet per dwelling unit. Principal uses permitted in this zoning district include both farm and nonfarm residential uses, farms, and recreational and institutional uses (44). Future development will depend on water availability.

Visual Resources

Visual resources were assessed for the area within 3 miles of the proposed site (a total study area of 49 square miles). (See Appendix J for an inventory of visual resources and an explanation of Scenic Quality and Tentative Management Classes.) Three miles is considered to be the extent to which the facility might impact surrounding visual resources.

At the Mobile site, Class A (high) scenic quality was associated with the Maricopa Mountains; Class B (common) resulted from diverse vegetation and dissected landform adjacent to the Maricopa Mountains; and Class C (minimal) was found in the creosote bush flats, including the proposed site. The Class C landscape was assigned a Tentative Management Class IV, while surrounding Class B landscapes were considered to be Manangement Class III. Several areas were identified as Management Class II because of high scenic quality and moderate viewer sensitivity. Three of these areas encompass the Maricopa Mountains. Management classes are shown on Figure 3-6.

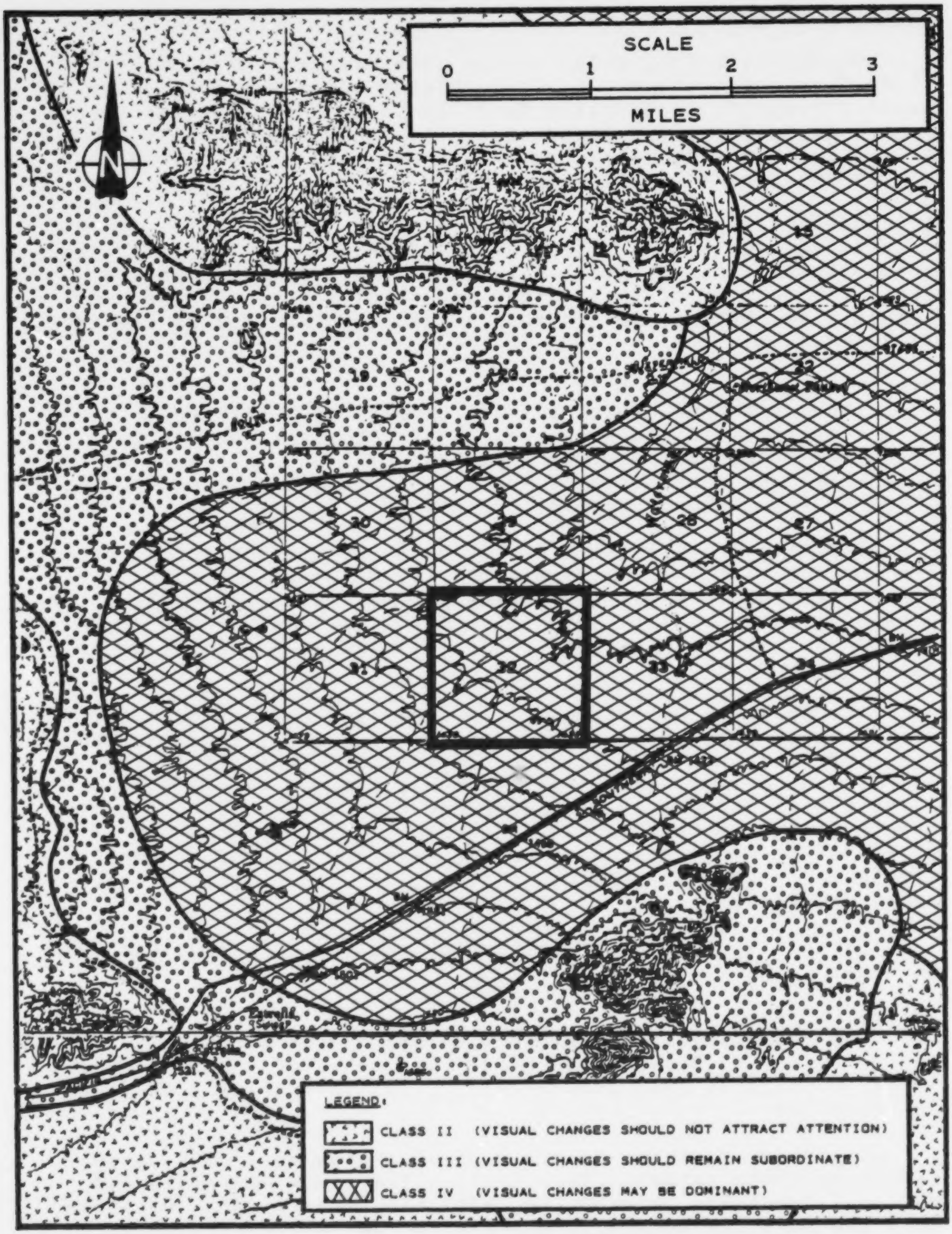
SCALE
0
1
2
3
MILES
N
LEGEND:
CLASS II (VISUAL CHANGES SHOULD NOT ATTRACT ATTENTION)
CLASS III (VISUAL CHANGES SHOULD REMAIN SUBORDINATE)
CLASS IV (VISUAL CHANGES MAY BE DOMINANT)

Figure 3-6. Visual resources within 3 miles of the Mobile site.

Cultural Resources

An area within 2 miles of the site was delineated as the study area for archaeological and historical inventories. Because a view of the proposed facility might constitute an impact upon a Native American ceremonial site, the larger 3-mile study area used to assess visual resources was also used to assess Native American cultural resources.

Archaeological--

No archaeological sites have been recorded within the study area. While archaeological sites are likely to exist in the area, the density of these sites is anticipated to be low. A synopsis of cultural development in southern Arizona is provided in Appendix K.

Historical--

There are four historic sites within the study area: the Gila Trail/Butterfield Stage Route, the Southern Pacific Railroad, the Telegraph, and Maricopa Road (Table 3-5). None of these has been registered as an historic monument by either the state or the National Register of Historic Places.

The Gila Trail/Butterfield Stage Route traverses the northern portion of the study area about 1.5 miles north of the proposed site (45). A military telegraph was established along this portion of the Gila Trail in 1873 (46). Portions of the route are marked with interpretive signs and used by Boy Scout groups as a hiking trail.

The Southern Pacific Railroad traverses the southern portion of the study area within 1 mile of the proposed site (45). Master Title Plats on file at the BLM State Office indicate that permission to cross government land was granted to the Southern Pacific Railroad Company in 1879, and that permission to construct telegraph lines across government land was granted in 1915 or 1919. An early automobile road, Maricopa Road, also parallels the Southern Pacific Railroad (45, 47, 48, 49). None of these resources currently has official status.

Further discussion of historical resources is provided in Appendix L.

Native American--

The study area is situated within the traditional territory of the Maricopa, Papago, and Pima. A summary of the Native American cultural resources inventory for this area is provided in Table 3-6.

A number of places in the general region were considered sacred by these tribes. They include the Sierra Estrella and Maricopa Mountains, Pima Butte, and Salt River Ridge. Of these, only the Maricopa Mountains are within the 3-mile study area. Rainbow Valley, together with the surrounding desert region, was

TABLE 3-5. HISTORICAL RESOURCES INVENTORY AND SENSITIVITY FOR THE MOBILE SITE

Name/Type/Description	Miles from Proposed Site	Official Status	Integrity	Principal Sources	Historical Significance	Sensitivity
Gila Trail/Butterfield Stage Route	1.5 North	No	Undetermined	Bolton 1930, 1960; Harris 1973; Walker and Bufkin 1973; Wagoner 1975	High	Moderate
Telegraph; 1915 or 1919	Within 1.0 South	No	Altered	Master Title Plats	Low	Minimal
Southern Pacific Railroad; 1879-Present	Within 1.0 South	No	Altered/ Working	Myrick 1975; Walker and Bufkin 1979; Master Title Plats; USGS 1973 (Mobile and Butterfield Pass 15' quads)	Moderate	Minimal
Maricopa Road	Within 1.0 South	No	Undetermined	Bryan 1922, 1925; USGS 1973 (Mobile and Butterfield Pass 15' quads)	Low	Minimal

TABLE 3-6. NATIVE AMERICAN CULTURAL RESOURCE INVENTORY FOR THE MOBILE SITE

Site Type	Site Location	Approximate Miles from Mobile Site
	RELIGION AND RITUAL	
Sacred Place	Maricopa Mountains	3.0 west
Sacred Trail	Maricopa Wells to Gila Bend	*
	FOOD AND OTHER RESOURCES	
Subsistence Area	Rainbow Valley	Vicinity
	TRAILS	
Trail	Rainbow Valley	*

* Precise location of the trails not determined in this study.

an important subsistence area. Temporary camps were reportedly occupied throughout the plain and the surrounding mountains to obtain food and other resource items. Sheep and deer were hunted in the foothills, and cholla, greasewood, mesquite, palo verde beans, and saguaro were gathered here. Members of the Ak-Chin and Gila River reservations continue to gather these materials. Cholla buds and mesquite beans are prepared for food; greasewood is used for its medicinal properties; and saguaro is an ingredient in wine used for annual rain ceremonies. In oral legend, a road taken by the dead led westward from Maricopa Wells across the Rainbow Valley and the Maricopa Mountains to beyond Gila Bend. The Apache passed through Rainbow Valley on raiding forages into Sonora.

Further discussion of the area's cultural development and history is provided in Appendices L and M.

Socioeconomics

Setting Summary--

The Mobile site is located in southern Maricopa County about 65 miles southwest of Phoenix. The Ak-Chin Indian Reservation lies about 16 miles east of the site. The Gila River Indian Reservation is situated along the western Pinal County border, 11 miles east of the site. Approximately 79 people reside in the Mobile area, located 6 miles east of the site. The community of Rainbow Valley lies about 15 miles north of the site. An unimproved road, paralleling some sections of the El Paso Natural Gas Company pipeline, leads from Rainbow Valley to Mobile.

Population--

Based on the 1980 census data, topographic maps, and field inspection of the area, estimates of current and projected population within 5, 10, and 15 miles of the site are shown in Table 3-7. Potential for future development in the area, especially within 5 or 10 miles, is impeded because of the limited water supply. The 1980 Arizona Groundwater Management Act limits the volume of individual domestic wells, and requires certification of assured long-term water supply for proposed subdivisions.

A potential source of economic/demographic change in the area is the oil refinery proposed by the Provident Energy Company. The proposed site is immediately south and east of the Mobile Elementary School bordering the south side of the Southern Pacific Railroad tracks. Preliminary site preparation has begun, and it is anticipated that construction will begin in the spring of 1983, coming on line in mid-1985. The construction force will peak at about 1,500 workers during the second year of construction. The labor requirement for the 47,500-barrel-per-day facility is anticipated to be about 300. It is the opinion of the Provident Energy Company, as supported by their socioeconomic studies, that the potential for population growth from this project in the immediate vicinity of Mobile is very small due to the absence of suitable housing and desired amenities (50).

TABLE 3-7. ESTIMATES OF CURRENT AND PROJECTED POPULATION WITHIN A 5-, 10-, OR 15-MILE RADIUS OF THE MOBILE SITE

	1980 Estimated	1985 Projected	1990 Projected	1995 Projected	2000 Projected
5 Miles	25	31	35	51	58
10 Miles	105	131	150	202	247
15 Miles	420	526	604	795	990

Provident expects that between 10 and 20 percent of its construction force might seek temporary accommodations in Maricopa or Gila Bend, with Maricopa being the most likely location once the road to the site is paved. Most of the operations force would be expected to commute from the south Phoenix, south Tempe or west Chandler areas, although some might reside in Maricopa and a few might commute from Gila Bend. It is not expected that the proposed refinery would significantly influence local population size or settlement patterns.

Communities within a 15-mile radius of the area include Mobile and Rainbow Valley. It is estimated that a total of about 80 persons live within a 5-mile radius of Mobile. A few ranchers and retired people live and remain in the Mobile area for work, while most adults commute to Phoenix for work (51). They drive to Maricopa, and then connect with Interstate 10 (I-10) outside Phoenix, a distance of 31 miles. Children in grades one through eight attend Mobile Elementary School. High school students commute to Maricopa to attend school in Maricopa District No. 20. The three-member Mobile Elementary School District No. 86 school board is the only form of government in the area. According to a school official, residents are of a variety of religious faiths. Although the local Baptist church had been unused for many years, residents of different denominations have begun worshipping there recently.

Rainbow Valley is a desert area which contains only scattered residences. The Gila River lies along the northern border of the valley, just south of the town of Liberty. Residents often differentiate between the northern and southern portions of the valley. The northern portion extends about 7 miles south from Liberty, and is called either Rainbow Valley or Estrella Dales; the southern portion is referred to as Deep Rainbow Valley. Rainbow Valley as a whole includes about 275 households and 872 people. Local residents estimate that there are 75 households and 238 people in Deep Rainbow Valley.

No local government exists in Rainbow Valley. Elementary students attend school in Liberty, while high school students attend Buckeye Union High School. There are three churches in northern Rainbow Valley, but none in Deep Rainbow Valley.

Tax Considerations--

The Mobile site is located in Tax Area Code No. 8600. In 1981, the comprehensive mill levy was $11.87 per $100 of assessed valuation. Commercial property is assessed at 25 percent of full cash value.

Employment, Labor Force, and Income--

There is no economic base in Mobile except for the elementary school and occasional working ranches in the general area. Most area residents commute to metropolitan Phoenix for work. The proposed Provident Energy Company refinery is expected to offer a large number of construction or operations jobs, as previously discussed, although few, if any, of the employees are expected to live in the immediate vicinity.

Rainbow Valley is primarily a "bedroom" community for the greater Phoenix area. Although there are several farms in the area, one resident estimated that only three in Rainbow Valley are currently being operated, apparently due to high ground water pumping costs. The main crops are cotton and alfalfa. A cotton gin and a small store are the only businesses in the area aside from the farms. At this time, no businesses appear interested in moving to or developing in Rainbow Valley. As Phoenix grows and expands, Rainbow Valley will probably continue to house commuters.

Tourists and Seasonal Population--

During the winter, a few campers stay around Mobile. An equestrian trail is currently planned by the county about one-half mile north of Mobile. The Estrella Sailport, located about 4 miles east of Mobile, has become internationally known for advanced soaring pursuits. Off-road vehicles are common in the winter. In addition, the area attracts 6 to 15 recreational vehicles, primarily at a local ranch (about 15 miles north of the site) that opens only during the winter.

WESTERN HARQUAHALA PLAIN SITE

Physical Setting

As defined in the ADHS initial siting study, the Harquahala Plain siting area is located in south-central Arizona, in the desert region of the Basin and Range Physiographic Province; it is bounded on the north and west by the Harquahala and Little Harquahala Mountains, and on the south by the Eagletail Mountains (2). This area consists of approximately the southern half of the western portion of the plain lying between the Little Harquahala and Eagletail Mountains. The Western Harquahala Plain site, located in the central portion of the siting area, is 2 square miles (Section 30, Township 3 North, Range 12 West and Section 25, Township 3 North, Range 13 West) (Figure 3-7). The area lies approximately 2 miles east of the Salome airfield which is abandoned.

Topography--

The Western Harquahala Plain area is located on a slightly concave portion of the Harquahala Plain, with few hills between the Little Harquahala and Eagletail Mountains. The area ranges from approximately 1,345 to 1,395 feet above sea level.

In general, the area slopes gently toward the southwest. A small area, approximately 4 square miles along the eastern edge of the plain, slopes gently toward the east. The area slopes very gently to the southwest at approximately 0.3 percent.

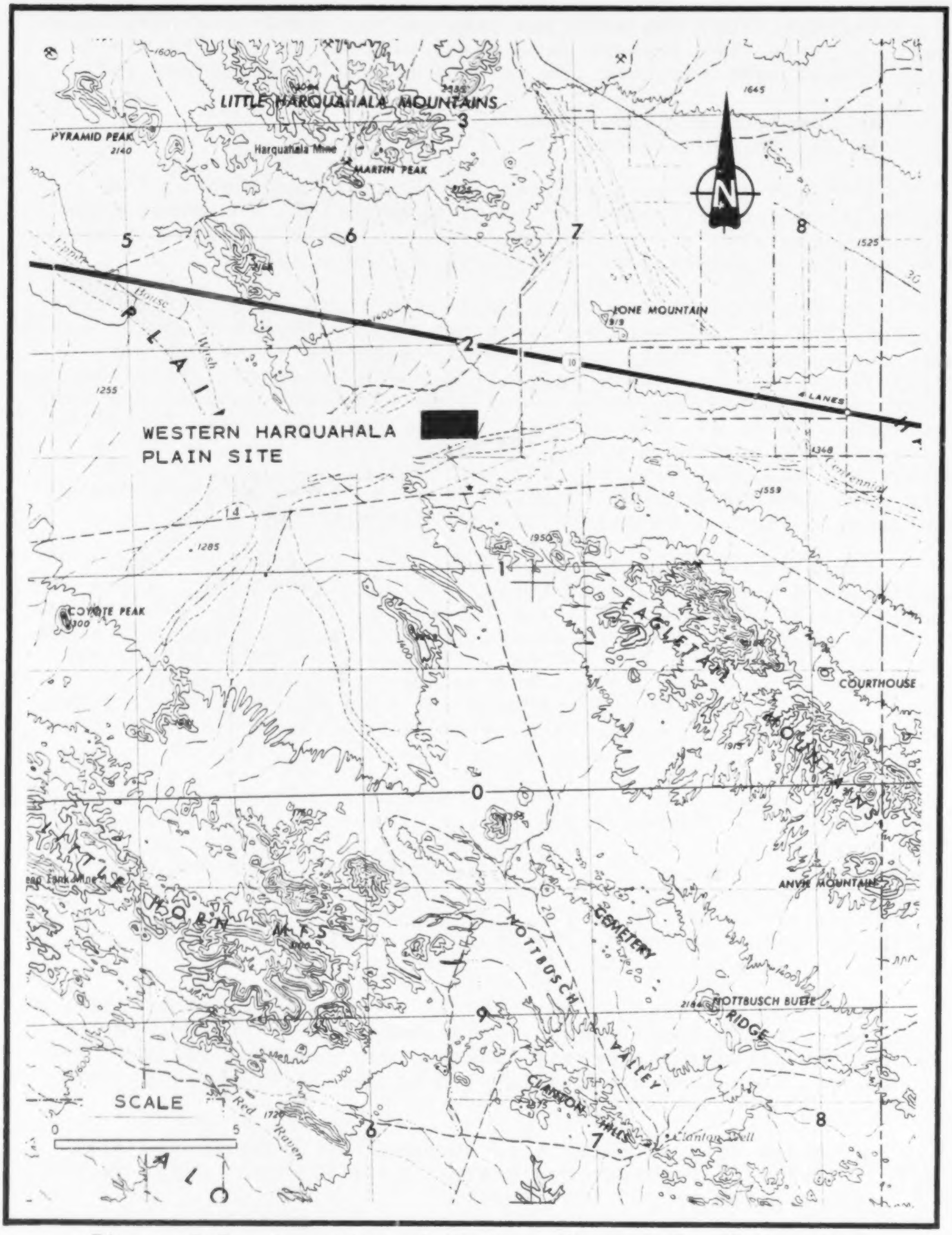
LITTLE HARQUAHALA MOUNTAINS
PYRAMID PEAK
2140
Harquahala Mine
MARTIN PEAK
N
5
6
7
8
3
2
1
0
9
LONE MOUNTAIN
1525
1645
10
4 LANES
1255
WESTERN HARQUAHALA PLAIN SITE
1368
1559
14
1285
1950
COYOTE PEAK
EAGLETAIL MOUNTAINS
COURTHOUSE
ANVIL MOUNTAIN
CEMETERY
NOTTBUSCH VALLEY
NOTTBUSCH BUTTE
RIDGE
CLANTON HILLS
Clanton Well
SCALE
0
5
Red Raven

Figure 3-7. Location of Western Harquahala Plain site.

Soils--

The U.S. Soil Conservation Service has prepared generalized soils maps for the Western Harquahala Plain site and its vicinity. These maps identify the following soil associations (52):

- Coolidge-Wellton-Antho.
- Gilman-Vint-Brios.

Soils of these associations are alluvial sediments. The dominant source materials for these associations are mixed igneous, sedimentary, and metamorphic rocks. Table 3-8 summarizes the pertinent generalized properties of these soils.

The Coolidge-Wellton-Antho Association is described as deep, medium- and coarse-textured soils on lower alluvial fans and valley plains (52). These soils exhibit moderate to moderately rapid infiltration rates, possess moderate water capacity, and contain moderate amounts of soluble salts in the subsoil and substratum. Soils of this association are used primarily for military proving grounds and bombing ranges, home sites, wildlife habitats, seasonal grazing, and recreational activities (52). The maps mentioned above indicate that the soils at the Western Harquahala Plain site belong to this association.

The Gilman-Vint-Brios Association is described as deep, medium- and coarse-textured soils on floodplains (52). These soils exhibit moderate to rapid filtration rates, and possess low to high potential water capacity. Local areas of these soils are slightly to strongly calcareous. All soils in this association are subject to brief sheet flooding during rainfall events. Soils of this association are used for home and industrial sites, irrigated cropland/pastureland, wildlife habitats, seasonal livestock grazing, and recreational activities.

Geologic Conditions--

The Harquahala Mountains to the north of the plain and the Eagletail Mountains to the south contain rocks ranging from Precambrian to recent in age. The mountains were upraised during a period of tectonic activity in the Late Tertiary Age, and are comprised of a variety of igneous, metamorphic, and volcanic rocks. Detailed geologic mapping is not available for the area around the site or for the surrounding mountains.

The area surrounding the site is underlain by valley fill of Late Tertiary to recent age. These sediments, which may be similar to the alluvial materials found in the Ranegras Plain to the southwest, have been divided into three distinct units, as follows:

- Upper Unit - consists of unconsolidated sediments with textures ranging from gravels to silts and clays; generally 700 to 900 feet thick.

TABLE 3-8. PROPERTIES AND FEATURES OF THE SOILS IN THE VICINITY OF THE HARQUAHALA PLAIN SITE, YUMA COUNTY*

Major Soil Association	Parent Material	Slope (%)	Permeability	Available Water Capacity (in/60 in)	Shrink/Swell Potential	Soil pH
Coolidge-Wellton-Antho	Dominantly schist and granitic rocks with some basalt, andesite, tuffs and calcareous sedimentary rocks					
Coolidge sandy loam		0-2	Mod rapid	Moderate	Low	7.9-8.4
Wellton loamy sand		0-2	Mod rapid	Moderate	Low	7.9-8.4
Antho sandy loam		0-5	Mod rapid	Moderate	Low	7.9-8.4
Gilman-Vint-Brios	Mixed igneous and sedimentary rocks					
Gilman loam		0-2	Moderate	High	Low	7.9-8.4
Vint loamy fine sand		0-2	Mod rapid	Moderate	Low	7.9-8.4
Brios sandy loam or loamy sand		0-2	Rapid	Low	Low	7.9-8.4

* Source: Reference 52.

- Middle Unit - consists of unconsolidated to poorly consolidated sand and gravel; may extend to depths of 1,500 feet; 600 to 800 feet thick.

- Lower Unit - consists locally of interlayered volcanic rocks (tuffs and flows) and coarse alluvial materials.

Available data are inadequate to assess fully the faulting and mineral resources in the area or at the Western Harquahala Plain site. Available mineral data indicate that there are three mineral deposits northwest of the area (10). There are no data to indicate the existence of mineral resources within the immediate area or at the Western Harquahala Plain site.

Climate--

Data collected at the Harquahala Plain meteorological station 20 miles east of the site are used to describe the climatological characteristics of the site (11).

Temperature--Mean monthly temperature for the Harquahala Plain station ranges from 48°F in January to about 90°F in July (Table 3-9). The range of temperatures to be expected in any one day may also be quite large. In January, the mean daily low temperature is about 31°F with a mean daily high about 65°F. In July, the mean daily low and high are 73°F and 107°F, respectively.

Precipitation--Table 3-9 presents mean precipitation for the local station. Rain showers in the site area are commonly light and of short duration, 30 minutes or less. Intense storms of 1 to 2 inches lasting for several hours occur occasionally. These storms are primarily convectional in nature and are characteristically local rather than widespread. Most storms have a diameter of less than 3 miles (53).

The greatest 24-hour rainfall that can be expected once in 2 years is 1.4 inches, and once in 100 years, 4.0 inches. Snow is rarely reported.

Evapotranspiration--No data on potential and actual evapotranspiration relevant to the site are available. Pan evaporation in the region is estimated to be between 80 and 100 inches per year, with summertime maximum of 14 inches per month, and winter figures of approximately 3 inches per month (11).

Wind--No wind rose data relevant to the site are available. Winds in the site area are strongly dependent upon the surrounding topography. Wind speeds are generally low except during storm frontal periods and thunderstorms (11).

TABLE 3-9. TEMPERATURE AND PRECIPITATION AT THE HARQUAHALA METEOROLOGICAL STATION*

Month	Mean Temperature (°F)	Total Precipitation (inches)
January	48.0	0.60
February	53.8	0.54
March	58.7	0.70
April	63.0	0.16
May	73.2	0.09
June	83.6	0.08
July	89.5	0.57
August	87.1	1.02
September	80.3	0.66
October	67.5	0.43
November	56.6	0.48
December	49.1	0.67
Annual	67.5	6.00

* Source: Reference 11.

Water Resources

Ground Water--

The principle aquifer in the Harquahala Plain is composed of alluvial basin-fill material and exists under water table conditions. These basin-fill deposits consist of clays, silts, sands and gravels, and vary in thickness from less than 300 feet near the mountains to more than 2,000 feet in the central portion of the Harquahala Plain (54). Most of the water yielded to wells in the area is from coarse sands, gravels, and/or loosely cemented conglomerates near the bottom of the alluvial sequence.

The Harquahala Plains site is between Ranegras Plain and Harquahala Plain ground water basins. The surrounding area is known locally as Hubbard Plain, but it is thought to be hydrologically connected to the Harquahala Plain (54, 55). Ground water flows toward the east-southeast and static ground water tables taken in 1978 and 1980 seem to indicate that the area is an extension of the Harquahala Plain ground water basin, but there are not enough wells in the vicinity to confirm this (54, 56).

Table 3-10 lists all known wells in the vicinity of the site and the depths measured to the static water table. The nearest upgradient well is about 1.5 miles to the northwest. Depth to ground water was 347 feet in January 1980. The nearest downgradient well is 3.75 miles to the southeast; depth to ground water was 418 feet in January 1980. Assuming that the ground water gradient is from west to east, a decline of about 5 feet in 7.5 miles results in an average gradient of 0.667 feet per mile. Since some of this area is unsurveyed and lacks ground control elevations, an assumed gradient of 0.75 feet/mile seems to be reasonable. The depth to ground water in Section 25 T3N R13W would then be around 340 to 345 feet while an approximate depth to ground water in Section 30 T3N R12W would be about 360 to 365 feet. Well (B-3-12)19aaa one mile north of Section 30 was measured in June 1975 (55). Depth to ground water was 410 feet which indicates that depths to ground water may approach 380 to 390 feet in the northern portion of Section 30.

Assuming a gradient of 1 foot/mile and a porosity of 20 percent and using a reported permeability of 40 gal/day/sq ft at Well (B3-13)23bbb (55), the average flow rate is calculated to be 14.6 feet/year. If an assumed gradient of 2 feet/mile and a porosity of 10 percent are used, an estimated average flow rate of 7.4 feet/year is calculated. Most likely the average annual ground water flow velocity is between 1.8 and 7.4 feet each year.

Surface Water--

There are no naturally occurring year-round surface waters on or near the Western Harquahala Plain site. The Granite Reef Aqueduct, part of the Central Arizona Project (CAP), passes to the north and is approximately 1,600 feet from the site at its

TABLE 3-10. DEPTH TO STATIC WATER TABLE AT WELLS IN THE VICINITY OF THE WESTERN HARQUAHALA PLAIN SITE*

Location	Date Measured	Depth in Water (in feet)
(B-2-12)2dda	January 1980	418
(B-3-12)19aad	June 1975	410
(B-3-13)19aad	January 1980	386
(B-3-13)23bbb	January 1980	347
(B-3-13)28adc	No access to Bone Well	(?)

* Source: Reference 54.

closest point (see Figure 3-8). This aqueduct is currently under construction.

There are no deeply cut, well-defined drainage channels at this site. Rainwater runoff apparently takes the form of sheet flow across the site in a southwesterly direction toward a broad, shallow wash some 3,000 feet to the south. The CAP aqueduct, however, would block the flow of much of the stormwater runoff from the surrounding watershed. Consequently, the flow of rainwater runoff over the site would likely be minimal. The unnamed wash into which rainwater would flow is a tributary of Upper Bouse Wash, some 7 miles to the west. The 100-year flood boundary map shows the site well outside the Upper Bouse Wash flood area, the only such flood zone identified in the vicinity (57).

Two livestock watering areas are in the vicinity of the Western Harquahala Plain site, one on the northern edge of the site, the other located 1 mile south of the southern edge of the site. Neither is a water catchment; both are tanks which appear to be supplied by water brought in by truck.

Air Quality

Background air quality for the Western Harquahala Plain site is shown in Table 3-11. Since there are no nearby air quality monitoring stations, the Buckeye, Parker, and Yuma sites were used to assess the ambient air quality (23). These sites are all more than 50 miles from the site. Table 3-11 shows that the levels of criteria pollutants (sulfur dioxide, carbon monoxide, ozone, and lead) are well within the state and federal AAQS.

Although there is no information concerning nitrogen dioxide or hydrocarbons, ambient concentrations should be well below the standards due to the rural setting and lack of significant sources of those pollutants. Particulate excursions are primarily due to natural causes, such as convective thunderstorms (dust storms) and/or fronts.

Public Health and Safety

Spills--

The current spill potential at this site is similar to that at the Mobile site.

Risks from Transporting Hazardous Wastes--

Trucks carrying hazardous waste loads to disposal sites in California would likely travel on I-10 through this area, though the number of such shipments is unknown.

Emergency Response--

Public safety is evaluated in terms of the effectiveness of present response capabilities for the nearby communities (Brenda, Harcuver, Hope, Quartzsite, Salome, Vicksburg, and Wenden), and for the two major transportation routes which currently provide the best road surfaces (Figure 3-3).

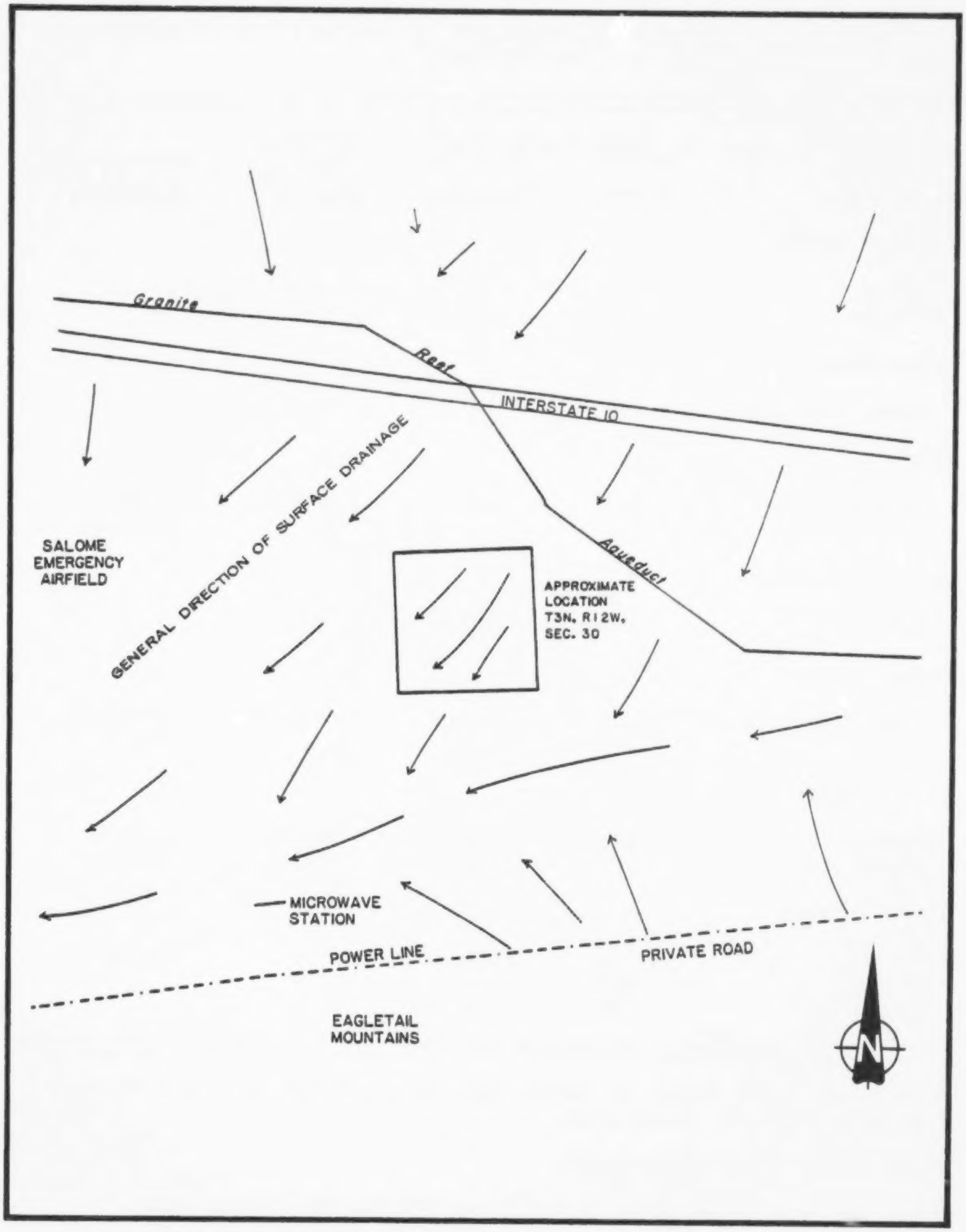
Granite
Reef
Aqueduct
INTERSTATE 10
GENERAL DIRECTION OF SURFACE DRAINAGE
SALOME
EMERGENCY
AIRFIELD
APPROXIMATE
LOCATION
T3N, R12W,
SEC. 30
MICROWAVE
STATION
POWER LINE
PRIVATE ROAD
EAGLETAIL
MOUNTAINS
N

Figure 3-8. Surface water drainage at Western Harquahala Plain site.

TABLE 3-11. AMBIENT AIR QUALITY AT THE WESTERN HARQUAHALA PLAIN SITE*

Pollutant	State/Federal AAQS[†] Primary	State/Federal AAQS[†] Secondary	Ambient Air Quality[#]	Monitoring Site(s)
Carbon Monoxide				
1-hour	40	40	13-15	Yuma
8-hour	10	10	6-8	
Hydrocarbons				
3-hour (6-9 a.m.)	160	160	N/A	
Lead				
Calendar Quarter	1.5	1.5	0.09-0.24	Buckeye, Parker
Nitrogen Dioxide				
Annual	100	100	N/A	
Ozone				
1-hour (Daily Max.)	0.12	0.12	0.05-0.10	Buckeye, Yuma
Particulates				
24-hour	260	150	145-343	Buckeye, Parker
Annual	75	60	76-127	
Sulfur Dioxide				
3-hour	--	1,300	31	Buckeye
24-hour	365	--	14	
Annual	80	--	2	

* Units are ug/m^3, except for carbon monoxide and ozone, which are in units of mg/m^3 and ppm, respectively.

† Ambient air quality standards.

# Maximum second high values for 1981, as provided by Olmstead (23).

The traffic count along I-10 is 7,600 cars per day, whereas the count on Exit No. 45 (to Harquahala) is 53 cars per day (PS-14). The most recent traffic count along Highway 60 shows a total of 1,800 cars per day (58).

The Harquahala Plain site currently (1982) falls within the* jurisdiction of the Yuma County Sheriff's substation at Salome. This two-officer substation is responsible for a 2,500-square-mile area. The deputy in charge of the station has had hazardous materials training, but has no special equipment. Resources available to him would include the Sheriff's Posse (if evacuation were necessary), the Arizona Department of Public Safety, and the Yuma County Hazardous Materials Team. Currently, no emergency medical facilities are available in this area.

The extent to which the Yuma County Hazardous Materials Response Team could provide assistance at this time is unknown. The team was organized only about 7 months ago; its members include employees of the city of Yuma fire and police departments, Yuma County Sheriff's Office, the County Emergency Services Department, pesticide companies, and chemical applicator groups. The team members' training in hazardous materials varies widely, and they are not currently well equipped as a unit. Their primary concerns are pesticide disposal problems and radiological hazards due to the nearby military bases. The team has just completed its organizational phase, and is now beginning to determine its goals and the degree to which it can respond to a variety of hazardous materials incidents. According to a spokesman for the team, the state's Division of Emergency Services would probably respond to a hazardous materials incident in the northern part of the county near the Western Harquahala Plain site.

The population in the area immediately surrounding the site is very low, about 1,677 people. In the four closest communities, no emergency response resources exist (Table 3-12). In the three other communities located near the site, only volunteer fire departments exist. Salome and Wenden are not likely to respond, because they are both underequipped and have had no training of any kind on hazardous materials. Quartzsite is the unit most likely to respond on a limited basis. The Quartzsite department is small, but some of its firefighters have had training in hazardous materials, and were involved in two recent chemical incidents, one requiring the evacuation of citizens in Ehrenberg. Because this is the only unit with some experience in

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* As of January 1, 1983, both the Western Harquahala Plain and Ranegras Plain sites will be in the new county of La Paz. Since no information is available on emergency and protective services in the new county, this discussion of Yuma County is included to indicate the current situation.

TABLE 3-12. EMERGENCY RESPONSE CAPABILITY IN THE WESTERN HARQUAHALA PLAIN AND RANEGRAS PLAIN AREAS

Communities	Distance from Site (miles)		Number of Firefighters		EMT/IMT#	Paramedics	Number with Hazardous Materials Training	Hazardous Materials Equipment
	RP*	WHP†	Volunteer	Paid				
Yuma County								
Brenda	17	17	0	0	0	0	0	None
Vicksburg	8	5	0	0	0	0	0	None
Hope	9	2	0	0	0	0	0	None
Harcuver	12	4	0	0	0	0	0	None
Salome	14	7	16	0	0	0	1	None
Wenden	19	12	8	0	1	0	0	None
Quartzsite	34	34	14	6	8	0	8	None
Maricopa County								
Tonopah	53	63	0	0	0	0	0	None
Buckeye**	78	87	140	0	14	4	37	Yes (HM equipped van)
Avondale	88	98	11	5	3	0	16	Yes
Phoenix	101	110	0	800	800	100	800	Yes (HM response team)
Tempe	107	116	0	111	111	18	10-15	Uses Phoenix HM team
Guadalupe	113	122	0	15	5	0	7	None

TABLE 3-12 (continued)

Communities	Distance from Site (miles)		Number of Firefighters		EMT/IMT[#]	Paramedics	Number with Hazardous Materials Training	Hazardous Materials Equipment
	RP[*]	WHP[†]	Volunteer	Paid				
Pinal County								
Sacaton	140	150	8	0	0	0	1	None
Coolidge	158	167	0	28	16	0	14	None
Casa Grande	152	161	20	12	32	3	6	None
Arizona City	161	171	16	0	0	0	0	None
Eloy	166	175	17	1	1	0	0	None
Pima County								
Marana	194	203	0	0	0	0	5	None
Tucson	216	225	0	450	450	5	450	Yes (part of HM response team)

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[*] Ranegras Plain.

[†] Western Harquahala Plain.

[#] Emergency Medical Technician/Instructor Medical Technician.

[**] Figures used for Buckeye combine both city fire department and rural fire department that surrounds area.

hazardous materials in the area, the firefighters handle incidents along I-10 from the California border to the Yuma-Maricopa county line.

The Western Harquahala Plain site has high potential for transit emergencies for two reasons. First, the transit routes expose a large number of communities, although few people, to possible danger (Table 3-12). Second, the best available transit routes require all vehicles to pass through the Phoenix metropolitan area, and to use Buckeye Road (at least for the next few years) to connect the two complete sections of I-10. These surface streets have higher accident rates than I-10.

The transit routes west of Phoenix to the Maricopa-Yuma county border pass through the communities of Buckeye and Avondale. Outside of the major metropolitan areas (Phoenix and Tucson), these are the only two potentially impacted communities with a true capability of responding to a hazardous materials transit emergency. Since both communities' jurisdictions now include portions of I-10 and/or Buckeye Road, the fire departments have begun to develop the capability to respond to a hazardous materials incident with trained personnel and special equipment.

Valley Fever--

There is no information on the incidence of or potential for Valley Fever (Coccidioidomycosis) at the Western Harquahala site. Because Valley Fever spores are endemic to desert areas in Arizona, it is presumed that the potential at the Western Harquahala Plain site is similar to that at the Mobile site.

Odor--

The affected environment, with respect to odor, is similar to that at the Mobile site.

Noise--

No data are available on background noise levels at the Western Harquahala Plain site. It is assumed to have background levels typical of a rural area (see discussion for Mobile site). Traffic on I-10, however, increases the overall background noise level within several hundred yards of either side of the highway.

Ecological Resources

Vegetation--

The area around the Western Harquahala Plain site may be considered within the Upper Bajada. A list of plant species found in the area is presented elsewhere (31). Vegetation in this area is sparse, and consists primarily of a Palo Verde-Saguaro community with some creosote and bursage (53). Areas of creosote are interlaced with trees of Palo Verde, saguaro, cacti, and ironwood (59). No threatened or endangered plant species are known to exist in the area (53).

Wildlife--

There are no specific data on species diversity for the area of the Western Harquahala Plain site. Wildlife within the general area includes mule deer, coyote, bobcat, kit fox, jackrabbit, cottontail, pocket mouse, woodrat, kangaroo rat, ground squirrel, birds, and various small reptiles (59). The area is several miles from the general range of the desert bighorn sheep, a threatened animal species. Bighorn sheep appear to inhabit areas outside the immediate vicinity. Some sheep are known to change ranges with the seasons, while others remain in one locale year-round (53). Therefore, an individual sheep may occasionally be found wandering near the area. Herds of desert bighorn may be found in the southern portions of the Eagletail and Big Horn Mountains, south and northeast of the area, respectively.

Land Use

Land Jurisdiction--

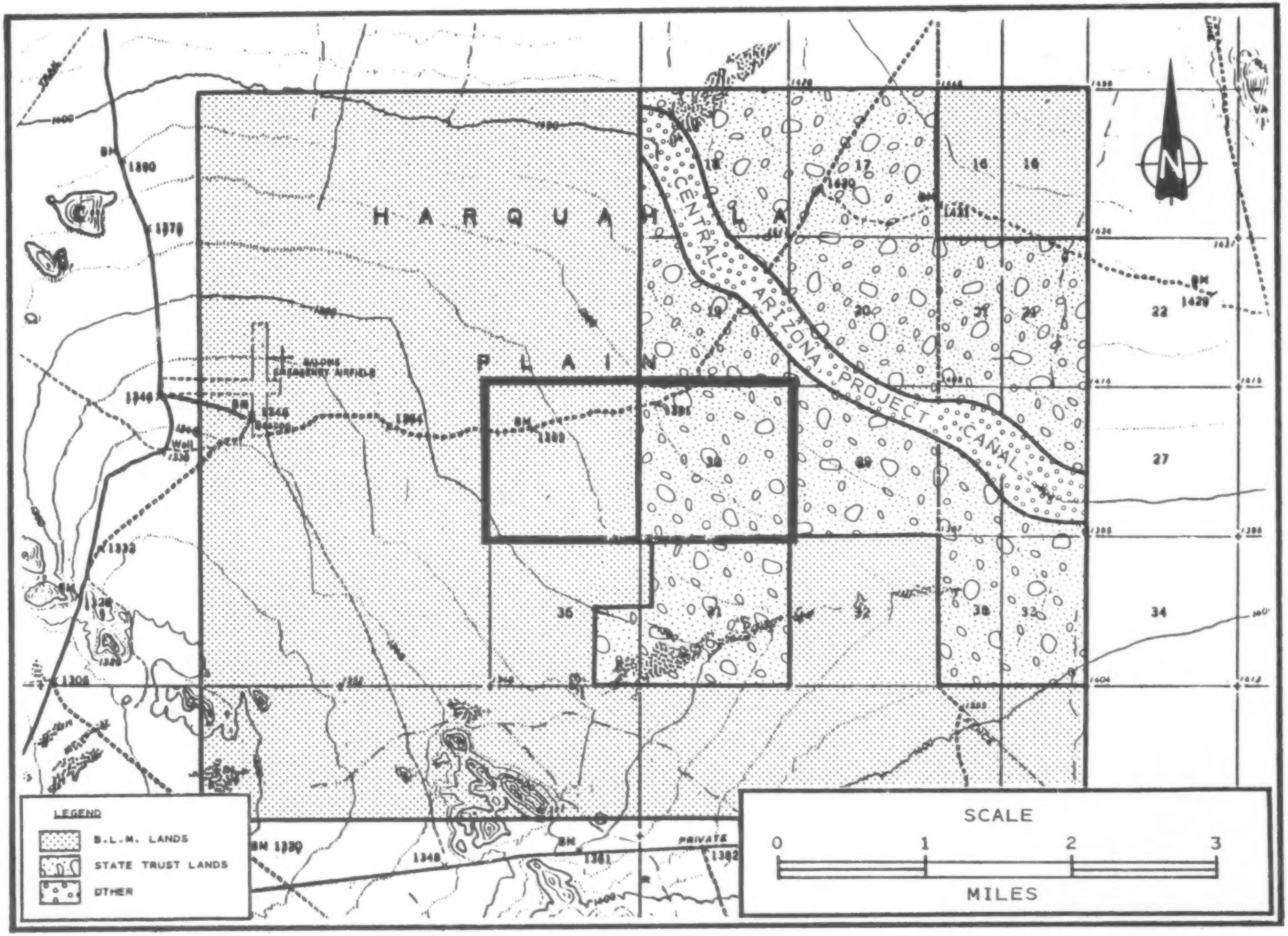
A significant portion of the land within 2 miles of the site (study area) is public land (Figure 3-9). These lands are situated primarily in the western half and southern portions of the study area. Arizona State Trust lands are located north and south of the Central Arizona Project (CAP) Canal in the eastern half of the study area. Private and other lands are located along the CAP Canal in the east half of the study area. The surface land and subsurface mineral rights are under the jurisdiction of BLM and ASLD.

Existing Land Use--

The Arizona State Parks Department has supported the Arizona Hiking and Equestrian Trails Committee in its effort to develop a trail system adjacent to the CAP Canal (Figure 3-10). Immediate priorities are canal trails in the Phoenix area and canal trails associated with existing recreation areas. Eventual completion of the trail system may include equestrian and hiking trails on the canal through the Harquahala Plain. Recreational use of BLM land within the study area is of a dispersed nature. Primary existing recreation opportunities include hunting, rock and mineral collection, off-road vehicle use, and sightseeing.

A very small portion of one WSA is situated in the extreme southeastern portion of the study area (Figure 3-10). Unit 2-128, Eagletail Mountains-Cemetery Ridge, consists of 120,925 acres and is located approximately 65 miles due west of Phoenix. The Eagletail Mountains-Cemetery Ridge study area encompasses the Eagletail Mountains to the north of the unit, Cemetery Ridge to the south, and the desert plain between the two ridges.

The majority of lands in the study area are BLM and ASLD administered; the land is principally used for grazing livestock (41). The study area is divided into two grazing allotments, and K Lazy B and Clem Allotments, whose qualifications are listed



HARQUAHALA PLAIN
CENTRAL ARIZONA PROJECT CANAL
N
16
17
18
19
20
21
22
27
28
29
30
31
32
33
34
35
36
SALOME EMERGENCY AIRFIELD
PRIVATE
LEGEND
B.L.M. LANDS
STATE TRUST LANDS
OTHER
SCALE
0
1
2
3
MILES

Figure 3-9. Land jurisdiction at Western Harquahala Plain site.

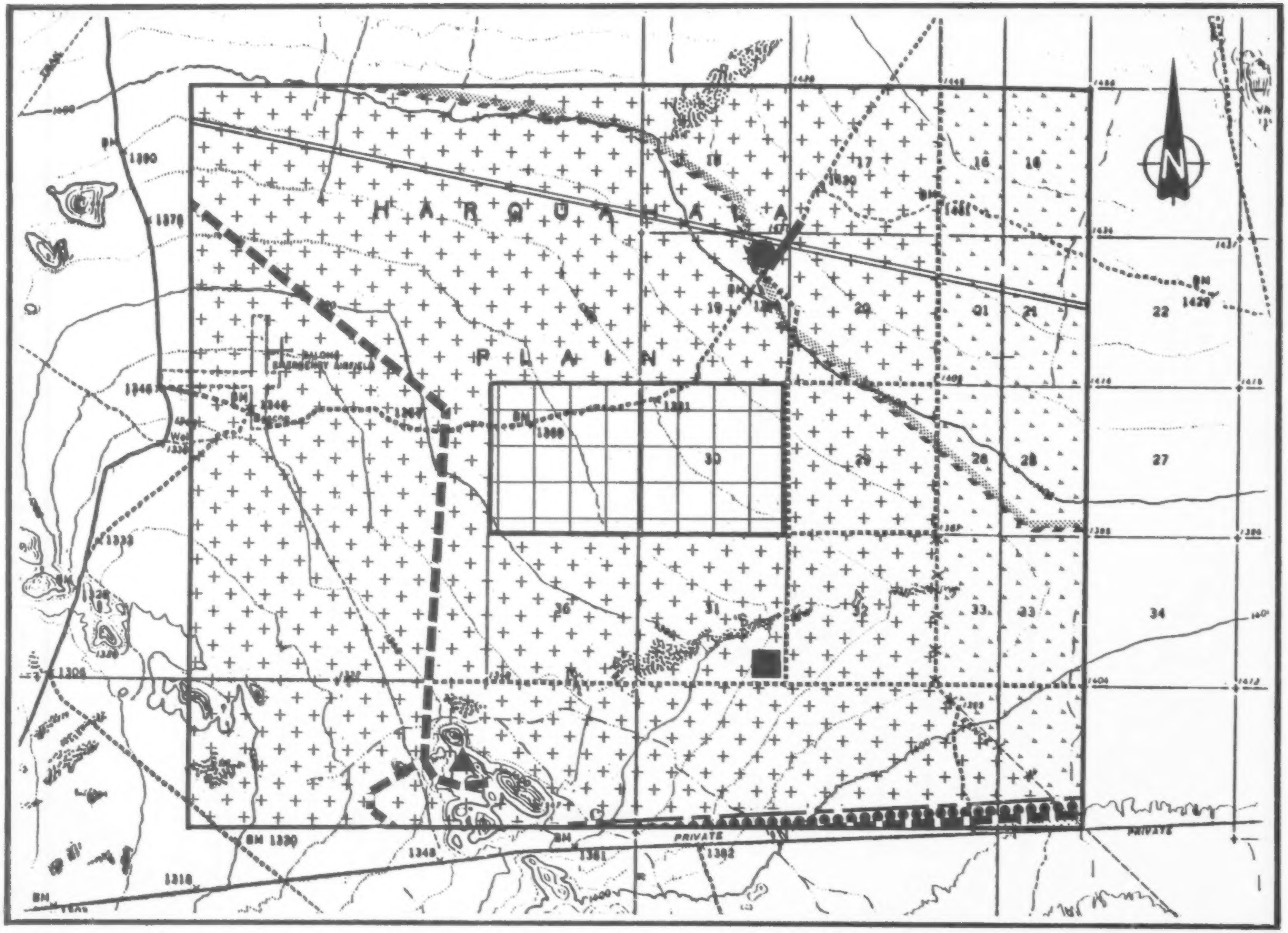

N
HARQUAHALA
PLAIN
16
17
18
19
20
21
22
27
28
29
30
31
32
33
34
36
PRIVATE
PRIVATE
BM 1330
1318
1348
1361
1382
1390
1378
1346

Figure 3-10. Existing land use at the Western Harquahala Plain site.

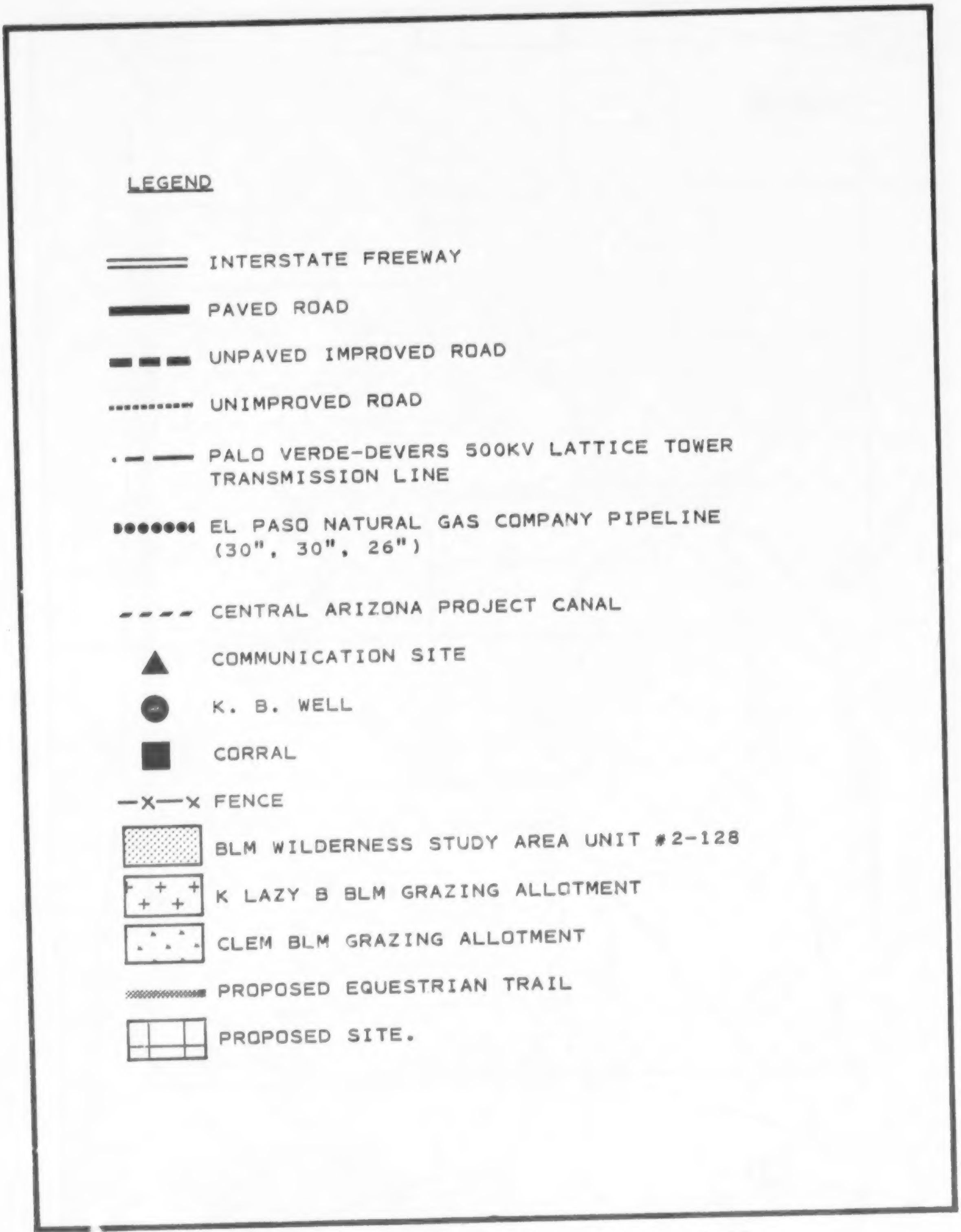

LEGEND
INTERSTATE FREEWAY
PAVED ROAD
UNPAVED IMPROVED ROAD
UNIMPROVED ROAD
PALO VERDE-DEVERS 500KV LATTICE TOWER TRANSMISSION LINE
EL PASO NATURAL GAS COMPANY PIPELINE (30", 30", 26")
CENTRAL ARIZONA PROJECT CANAL
COMMUNICATION SITE
K. B. WELL
CORRAL
FENCE
BLM WILDERNESS STUDY AREA UNIT #2-128
K LAZY B BLM GRAZING ALLOTMENT
CLEM BLM GRAZING ALLOTMENT
PROPOSED EQUESTRIAN TRAIL
PROPOSED SITE.

Figure 3-10a. Legend to Figure 3-10.

below. Note that the study area allotments represent only a portion of the entire K Lazy B and Clem allotments (60, 61):

- K Lazy B Allotment -
  Range: managed as perennial-ephemeral
  Season of use: year-long
  Class of livestock: cattle and horses
  Base herd qualifications: 1,861 AMU's, the equivalent of 165 cows year-long. This base herd qualification was determined using a figure of 94 percent federal range.

- Clem Allotment -
  Range: managed as perennial-ephemeral
  Season of use: year-long
  Class of livestock: cattle and horses
  Base herd qualifications: 3,216 AMU's, the equivalent of 400 cows year-long. This base herd qualification was determined using a figure of 67 percent federal range.

Existing range improvements within the study area are the K. B. well, corral, and fence. These are shown on Figure 3-10. None of these is on the sections proposed for the site.

Currently, there is one 500-kV lattice tower extra high-voltage line that traverses the study area (Figure 3-10). The Southern California Edison Company transmission right-of-way parallels the El Paso Natural Gas (EPNG) pipeline along the southeastern portion of the study area. The EPNG owns and operates all of the natural gas pipelines in the study area. Three lines (two 30 inches in diameter, and one 26 inches) are located in the same right-of-way which bisects the southeastern portion of the study area (62).

In 1964, the Colorado River Basin Project authorized construction of the CAP Canal. The CAP Canal is a water-delivery system which will furnish municipal, industrial, and irrigation water to urban and agricultural areas within Maricopa, Pinal, and Pima Counties. The Granite Reef Aqueduct portion of the canal enters the study area in the northwest corner, and traverses the northern and east-central portions of the study area.

The Salome Communication site is a radio relay station located approximately 4 miles due south of I-10 in the eastern half of the study area (Figure 3-10). Both American Telephone and Telegraph and Mountain States Telephone and Telegraph companies utilize this facility.

I-10 is located east to west through the northern portion of the study area (Figure 3-10). The only section of paved road in the study area consists of an I-10 overpass adjacent to the CAP Canal. Two unpaved improved roads were identified. The first road, generally oriented in a north-to-south direction, provides access to the Salome Communication site, as well as serving as an interconnection point to the EPNG pipeline and Palo Verde-Devers

500-kV transmission line right-of-way from I-10. The second road is the utility access road which bisects the southeast corner of the study area. Unimproved roads identified generally serve as interconnection ties between other unimproved roads and the remaining roadway network.

Future Land Use--

The District IV Council of Governments is the regional planning and coordination agency for Mohave and Yuma Counties and for various municipalities and special districts. The District has prepared a Land Use Plan adopted in 1978 for their regional planning area. No specific future plans, however, exist within the two Yuma County study area sites.

The Yuma County 1985 Comprehensive General Plan, adopted in 1970, is out-of-date and not adhered to (63). Note that the study area will no longer be within Yuma County as of midnight December 31, 1982. January 1, 1983, officially marks the separation of northern Yuma County into the new county of La Paz. A three-member commission was appointed by Yuma County supervisors to coordinate the planning of the new county.

Land uses projected to occur by BLM and the ASLD in the study area indicate that the area should remain essentially the same in the foreseeable future (38, 41, 42, 43). Livestock grazing is the predominant land use. Yuma County has not zoned the area for specific uses.

Visual Resources

The visual resources assessment was performed for the area located within 3 miles of the Western Harquahala Plain site, resulting in a total study area of 56 square miles.

The study area was identified as visual quality Class C (minimal). Because of the high use-volume associated with I-10 (considered to be a key observation point) and a foreground/middleground distance zone (from I-10), the northern half of the study area was considered to be a Management Class III area (64). The southern portion included a Management Class IV (background distance zone) and a Class I area (WSA 2-127). Results are shown on Figure 3-11.

Cultural Resources

Archaeological--

BLM archaeologists reported a single artifact during the Class II survey (65, 66). Five sites were recorded within the study area: two temporary camps, two lithic scatters, and rock-wall structures (Table 3-13). While additional sites are likely to exist in the area, the density of sites is anticipated to be low. A synopsis of cultural development in southern Arizona is provided in Appendix K.

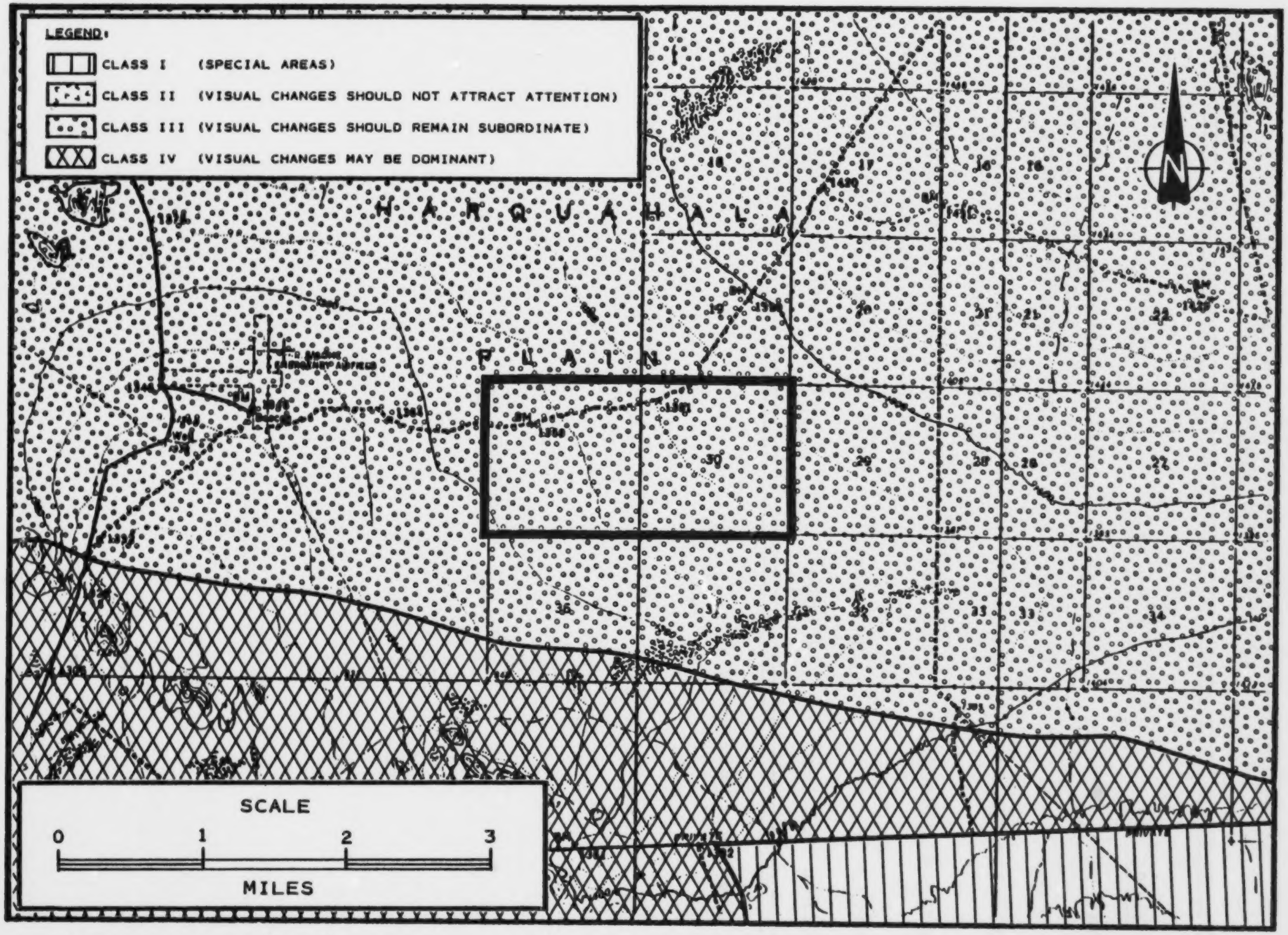

LEGEND:
CLASS I (SPECIAL AREAS)
CLASS II (VISUAL CHANGES SHOULD NOT ATTRACT ATTENTION)
CLASS III (VISUAL CHANGES SHOULD REMAIN SUBORDINATE)
CLASS IV (VISUAL CHANGES MAY BE DOMINANT)
N
HARQUAHALA
PLAIN
SCALE
0
1
2
3
MILES

Figure 3-11. Visual resources within 3 miles of the Western Harquahala Plain site.

TABLE 3-13. ARCHEOLOGICAL SITE INVENTORY FOR THE WESTERN HARQUAHALA PLAIN*

Site Type	Cultural Affiliation	Description
Temporary camp	Unknown	Milling slabs, rhyolite core, scraper, chopping tool and one flake. Food processing.
Wall structures	Unknown	Two rock-wall structures. Possible hunting blinds.
Temporary camp	Unknown	Two milling slabs, one flake, one chopper, possible hearth.
Lithic scatter	Unknown	Two rhyolite lithic scatters.
Lithic scatter	Unknown	Rhyolite lithic scatter.

* Source: Reference 66.

Historical--

No historical sites are recorded within the study area.

Native American--

The Western Harquahala Plain was most frequently occupied and utilized by the people of the Yavapai, Maricopa, and Pima tribes. The surrounding elevated areas, in particular the Harquahala, Eagletail, and Big Horn Mountains, were very important locales for religious ceremonies, and figure predominantly in the oral traditions of these tribes. However, all of these areas are located beyond the study area. A summary of the Native American cultural resources inventory for the Western Harquahala Plain is provided in Table 3-14.

The Harquahala Plain was an important subsistence area for agriculture, hunting, and gathering traditional plant resources. Centennial Wash was also an important subsistence source. Two trail systems passed through the Harquahala Plain. The Ehrenberg-Arlington Trail, which was estimated to be in use as early as the Hohokam Era, continued to play an important role in the nineteenth century. Hohokam tribes in the Gila Bend area traded with Colorado River groups via the Ehrenberg-Arlington Trail. Cocomaricopa mail carriers travelled the route between Mexico and California to avoid hostile Mojave and Yuman groups. Trailside shrines are associated with this trail. Another trail was used by the Panya travelling between the Gila River and Parker Valley, often referred to as their "high road" or "best road."

Further discussion of the area's cultural development and history is provided in Appendices L and M.

Socioeconomics

Setting Summary--

The Western Harquahala Plain site is located in east-central Yuma County, about 90 miles west of the Phoenix metropolitan area and 50 miles southwest of Wickenburg, south of the 56-mile marker on I-10. North of the site, a few residents are scattered around the Little Harquahala Mountains and along Salome Road which runs northwest from I-10 to the town to Salome. Populations are more concentrated along U.S. Highway 60, which runs northeast 79 miles from I-10 to Wickenburg. Along U.S. Highway 60 is a cluster of towns that are 13 to 20 miles from the site. The towns are Brenda, Vicksburg, Vicksburg Junction, Hope, Harcuvar, Salome, and Wenden. Within this cluster of towns, Hope, Harcuvar, and Salome are located within 15 miles of the Western Harquahala Plain site.

Hope is located at the junction of State Highway 72 and U.S. Highway 60, about 13 miles northwest of the site. Today, one family lives in Hope. A gas station, the only business in town, serves the surrounding residents, farmers, ranchers, miners, and highway travelers. A local resident estimates that 175 to 200

TABLE 3-14. NATIVE AMERICAN CULTURAL RESOURCE INVENTORY FOR THE WESTERN HARQUAHALA PLAIN SITE

Site Type	Site Location	Approximate Miles from Harquahala Plain Site
	RELIGION AND RITUAL	
Trail Shrines	Ehrenberg-Arlington	* Trail
	FOOD AND OTHER RESOURCES	
Subsistence Area	Harquahala Plain	Vicinity
Subsistence Area	Centennial Wash	Vicinity
	TRAILS	
Trail	Ehrenberg-Arlington	*
Trail	Gila River to Parker	* Valley

* Precise location of trail not determined in this study.

people live in the surrounding area, not including Salome. The Vicksburg Elementary School District No. 3 school board has three elected members, and no other local government in the immediate area exists.

Harcuvar is located on U.S. Highway 60, northeast of Hope and 13.5 miles from the site. About 30 mobile homes and houses, a few businesses, and a church are scattered along the highway. The town businesses serve the local community, highway travelers, and winter visitors. A local resident estimated that the population is about 100 in the summer, increasing during winter months when tourists visit the area. No local government outside of the district's school board exists in the town.

Salome is the largest town in the immediate vicinity; the postmaster estimates it has 300 to 400 people, with several hundred more residing south of the town. It is located at the junction of U.S. Highway 60 and Salome Road, northeast of Harcuvar, and almost 14.5 miles north of the site. Salome's businesses, like those in Hope and Harcuvar, serve the surrounding area and tourists. Salome consists of about 20 businesses, such as a bank, cafe, gas stations, stores, motels, bars, recreational vehicle parks, and an equipment company. The area's only high school is located at Salome. Like Hope and Harcuvar, there is no local government in the area aside from the school district. Salome has a volunteer fire department. The town also has three churches.

Population--

Based on 1980 census data, topographic maps, and field inspection of the study area, estimates of current and projected population within 5, 10, and 15 miles of the site are shown in Table 3-15. Growth in the area is expected to be slow and gradual, primarily from tourism and retirees moving into the area.

Tax Considerations--

The Western Harquahala Plain site is located in Tax Area Code No. 1900. In 1981, the comprehensive mill levy was $11.08 per $100 of assessed valuation. Commercial property is assessed at 25 percent of the full cash value. Full cash value is defined to be 85 percent of the market value (67).

Employment, Labor Force, and Income--

The major employers in the area are the Crowder Cattle Company, located in Vicksburg, and Shawler Farms, whose Agua Bonita Farm is about 3 miles south of Hope. In addition, there are 30 to 40 smaller farms in the area. The main crops are cotton and alfalfa. Other residents own or are employed by the businesses and schools in the surrounding area. Tourism is a large business in the towns. Travelers often use U.S. Highway 60 to reach Prescott and the Grand Canyon from California. A large number of retired people live in the area also. Mining for gold, silver, and copper once flourished in the Little Harquahala Mountains. Today, mining has been reduced to about six small operations.

TABLE 3-15. ESTIMATES OF CURRENT AND PROJECTED POPULATION WITHIN A 5-, 10-, OR 15- MILE RADIUS OF THE WESTERN HARQUAHALA PLAIN SITE

	1980 Estimated	1985 Projected	1990 Projected	1995 Projected	2000 Projected
5 Miles	5	5	5	5	5
10 Miles	30	31	31	31	32
15 Miles	930	962	978	993	1,009

Residents seem confident that the slow, gradual growth their towns have experienced the past 10 years will continue. The residents believe that the Central Arizona Project may bring some new jobs. In addition, while the area's water system needs updating to fill the increasing need, water is available (68).

Tourists and Seasonal Population--

Tourists are common in the area all year around, but primarily in the winter. The Kofa National Wildlife Refuge, located 12 miles from the site, estimated 180,000 visitor-days in 1977. Tourists visit the area for hunting, rock collecting, and driving off-road vehicles.

RANEGRAS PLAIN SITE

Physical Setting

The Ranegras Plain siting area is located in south-central Arizona within the Basin and Range Physiographic Province; it is bounded by the Eagletail and Little Harquahala Mountains to the east, the Little Horn Mountains to the south, and the New Water and Kofa Mountains to the west (2). The 2-square-mile Ranegras Plain site comprises Sections 9 and 10, Township 2 North, Range 14 West (Figure 3-12).

Topography--

The portion of the Ranegras Plain around the site is concave, sloping gently inward from the surrounding mountains and ultimately sloping toward the northwest along the alignment of Bouse Wash. Since the mountains on the east side of the area rise more abruptly than those to the west, most of the immediate area slopes gently to the northeast. The proposed site, located in the west-central portion of the plain, parallels this trend, sloping toward the northeast at approximately 0.5 percent. Its elevation ranges between approximately 1,320 and 1,380 feet above sea level.

Soils--

Generalized maps prepared by the U.S. Soil Conservation Service (52) identify hyperthermic-arid soils of the Coolidge-Wellton-Antho and the Gilman-Vint-Brios Associations in the vicinity. These associations are the same as those identified in the vicinity of the Western Harquahala Plain site.

Available information is inadequate to permit an assessment of faulting and mineral resources in either the general area or at the Ranegras Plain site.

Climate--

The climatic setting of the Ranegras Plain site is similar to that described for the Western Harquahala Plain site.

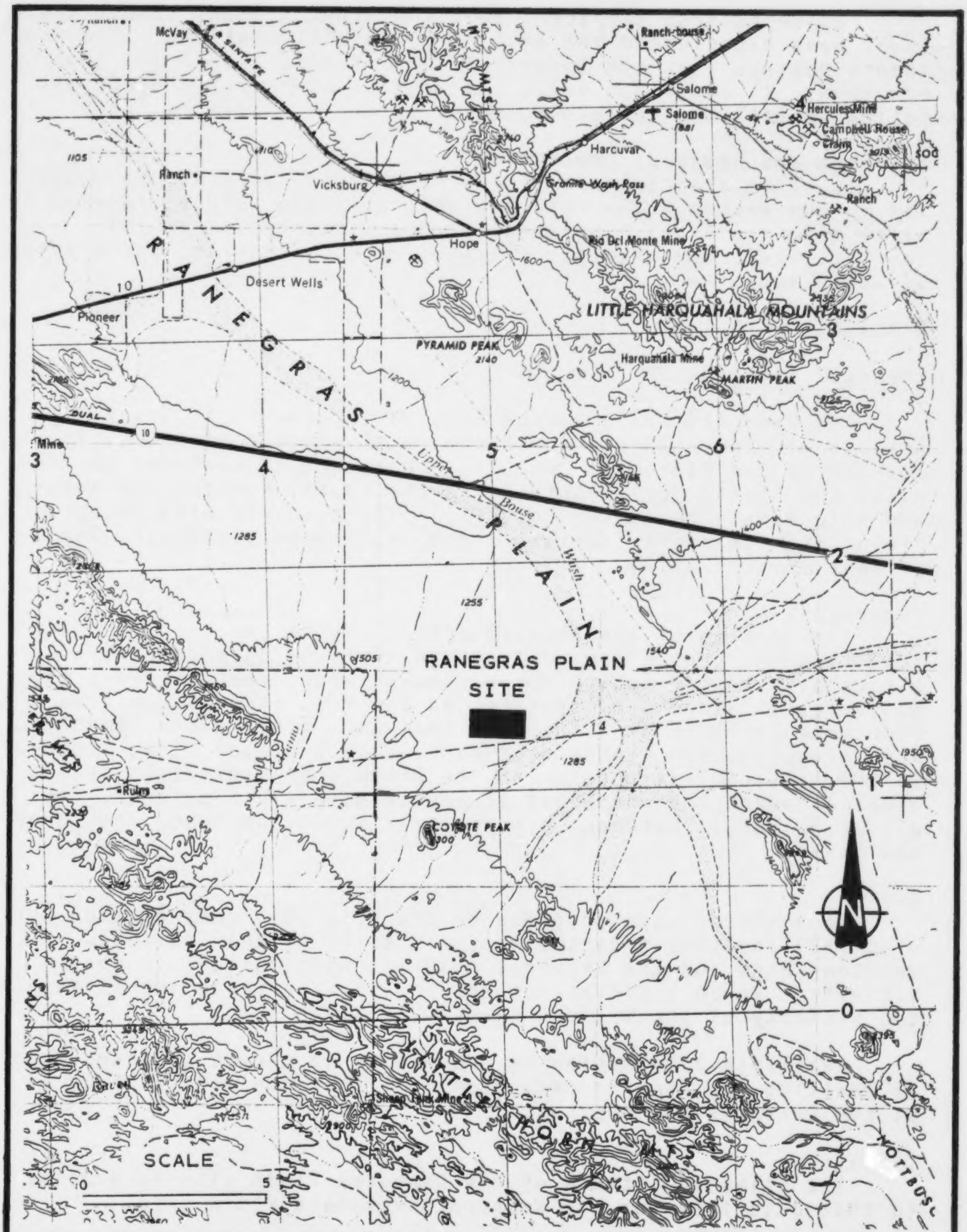

McVay
Ranch-house
Salome
Hercules Mine
Campbell House
Harcuvar
Vicksburg
Ranch
Granite Wash Pass
Hope
Rio Del Monte Mine
Desert Wells
Pioneer
RANEGRAS PLAIN
LITTLE HARQUAHALA MOUNTAINS
PYRAMID PEAK
Harquahala Mine
MARTIN PEAK
Upper Bouse Wash
10
RANEGRAS PLAIN SITE
COYOTE PEAK
SCALE
0
5
N
1
2
3
4
5
6

Figure 3-12. Location of Ranegras Plain site.

Water Resources

Ground Water--

The major aquifer in the Ranegras Plain is the alluvium that fills the basins between the mountain ranges. Ground water conditions in various portions of the northern and upper portions of the Ranegras Plain have been described, but the total thickness of the alluvium in the vicinity is unknown (55, 69, 70, 71). The driller's log of Well (B-2-14)10cdc, which is located on the site, shows that there is a considerable thickness of clay and clay to gravel mixture in the upper 340 feet of the well. Coarse gravel, sands, and sandy clays to clayey sands are found at depths up to 455 feet. Wells to the north and west of the area have been drilled to over 1,000 feet with clay and clayey sands being the main alluvial material. Ground water flows to the northwest (55, 70).

The depth to ground water in Well (B-2-14)10cdc was measured in 1975 at 331.5 feet or a 0.5 foot decline since the measurement made in 1968. Table 3-16 lists wells in the vicinity of the site. At the Ranegras Plain site, depth to ground water is between 320 and 340 feet and ground water flows toward the north.

Assuming a ground water gradient of 10 feet in 6 miles and a porosity of 15 percent, and using a reported permeability of 40 gal/day/sq ft (55), an estimated average flow rate of 4.1 feet/year is calculated. If an assumed gradient of 10 feet in 2 miles is used, then the estimated average flow rate of 12.3 feet/year is calculated. Most likely the average flow rate is between 4.1 and 12.3 feet/year.

Surface Water--

The drainage channels at the Ranegras Plain site are not very prominent, indicating that rainwaters run off the site as sheet flow. Drainage is to the northeast, toward Upper Bouse Wash. While the wash is subject to flash flooding, the site itself is over 2 miles from the wash and well outside the flood zone shown on the 100-year flood boundary map (57). In addition, a drainage ditch paralleling a road south of the site appears to divert some of the rainwater runoff away from the site toward the east (see Figure 3-13).

There are no year-round water bodies on or near the site. There is a cattle pond in the southwest corner of Section 10, which appears to be fed by surface water runoff and supplemented by water which is either pumped at the pond or trucked in.

Air Quality

The Ranegras Plain is located within 10 miles of the Western Harquahala Plain on even terrain. Since it is in the same airshed and relatively close to the Western Harquahala Plain, it is expected that both sites share the same air quality characteristics.

TABLE 3-16. DEPTH TO STATIC WATER TABLE AT WELLS IN THE VICINITY OF THE RANEGRAS PLAIN SITE*

Location	Date Measured	Depth to Water (in feet)
(B-2-14)10cdc	January 1975	331.5†
(B-2-14)10cdc	April 1968	332
(B-2-14)28cdc	1975	306
(B-3-15)2dab	April 1968	188
(B-3-15)2dab	August 1967	192
(B-3-15)23bdb	(reported in 1947)	287
(B-3-15)23bdb	August 1967	282
(B-4-14)30cca	August 1967	187
(B-4-14)30cca	November 1948	186
(B-4-15)23daa	August 1967	172
(B-4-15)23daa	April 1968	179
(B-4-15)23ddd	November 1948	158

* Source: Reference 70.

† Measured by USGS on January 16, 1975.

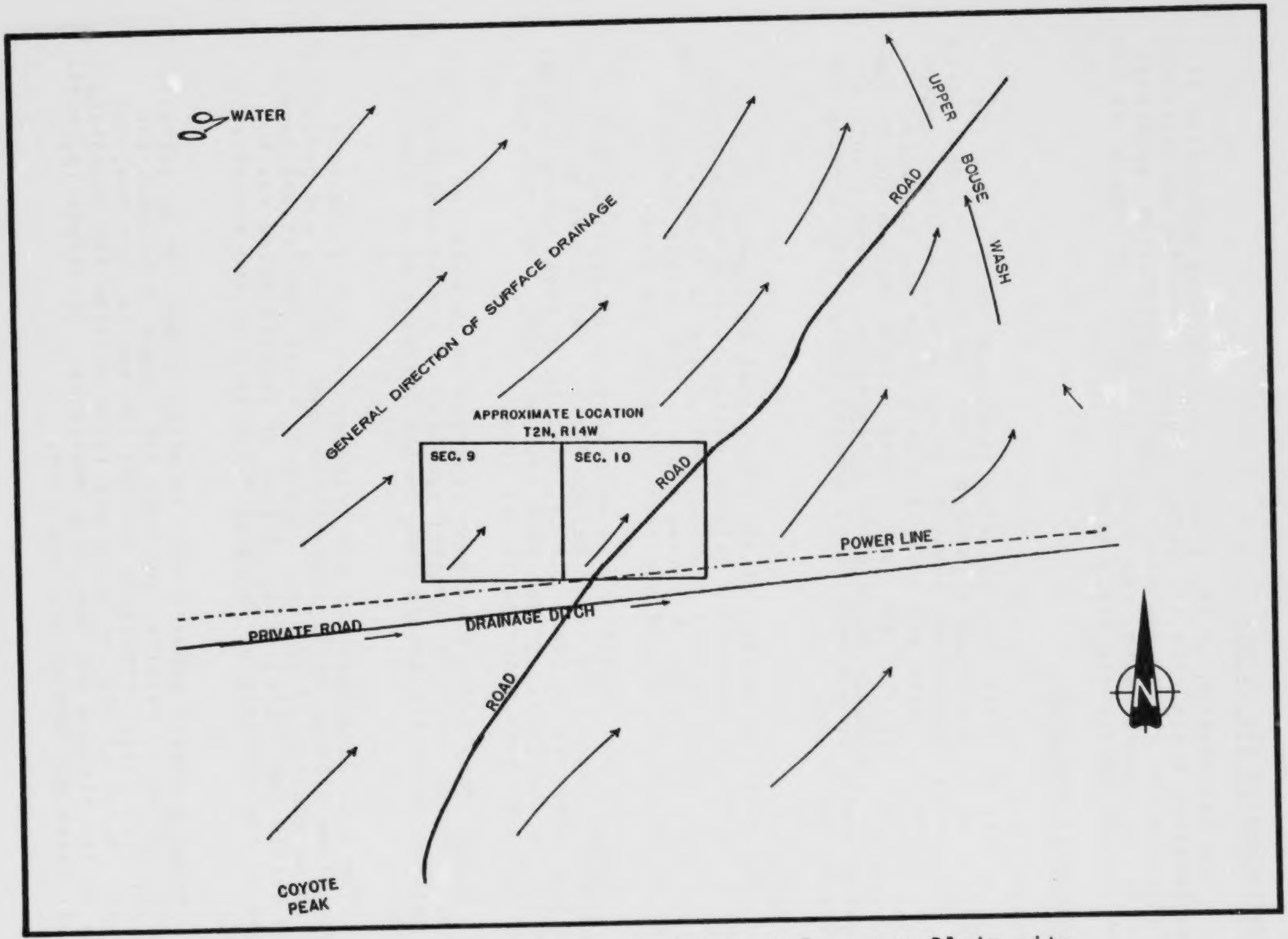

WATER
GENERAL DIRECTION OF SURFACE DRAINAGE
APPROXIMATE LOCATION
T2N, R14W
SEC. 9
SEC. 10
ROAD
UPPER
BOUSE
WASH
ROAD
POWER LINE
PRIVATE ROAD
DRAINAGE DITCH
ROAD
N
COYOTE
PEAK

Figure 3-13. Surface water drainage at Ranegras Plain site.

Public Health and Safety

The description of the present environmental conditions at the Ranegras Plain site (in terms of spills, traffic patterns and transportation risks, emergency response capabilities, potential for Valley Fever, noise, and odors), is similar to that given for the Western Harquahala Plain site.

Ecological Resources

Vegetation--

A list of plant species which have been found within the siting area is presented elsewhere (31). No federally endangered or threatened species are known to occur in or near the proposed site. However, there are several plants which are protected under Arizona Native Plant Law. These plants include the following genera: *Opuntia*, *Castela* and *Peniocereus*. Three plants of night-blooming cereus were found growing among white bursage and creosote bush (53).

Wildlife--

The wildlife habitat of the study area is typical of most desert lands. A precarious balance exists between the environment and wildlife species. Animals which may be found within the siting area are coyote, kit fox, badger, jack rabbit, kangaroo rat, pocket mouse, ground squirrel, lizards, and birds.

Reptiles and amphibians--A wide variety of reptiles and amphibians inhabit the lower Bajada Plain. The desert tortoise has been observed in the vicinity, usually in areas where burrows are easily dug (i.e., gravel wash bottoms) (59). The Gila monster has also been observed in the area.

Birds--Many birds have been reported on or near the proposed site, although many are seasonal species. A significant number of species avoid the desert and use the Colorado River riparian area.

The U.S. Department of the Interior has listed the bald eagle, Yuma clapper rail, zone-tailed hawk, osprey, and peregrine falcon as endangered species. However, these species are rarely seen within the siting area. A list of species which may be found in the vicinity of Ranegras Plain is provided elsewhere (31).

Mammals--Small mammals such as mice, shrews, rats, gophers, ground squirrels, rabbits, and bats are common throughout the general area (59). Predators include the coyote, kit fox, and badger. Herds of bighorn sheep are found outside the immediate area in the Plomosa and Dome Rock Mountains. Occasionally, individual sheep may wander near the site.

Land Use

Land Jurisdiction--

Public lands comprise the entire study area with the exception of 320 acres of private and other land located in the northwest and 560 acres of Arizona State Trust land situated in the northeast (Figure 3-14). Surface land and subsurface mineral rights are administered by BLM.

Existing Land Use--

A portion of one WSA is located in the southeastern part of the study area (Figure 3-15). Unit 2-127, Little Horn Mountains, contains 91,930 acres and is situated approximately 38 miles southeast of Quartzsite, Arizona. Unit 2-127 includes the eastern half of the Little Horn Mountains, a large portion of the Ranegras Plain to the north, and a small portion of the Palomas Plain and Nottbusch Valley.

Recreational opportunities in the study area are similar to those identified for the Western Harquahala Plain site: hunting, rock and mineral collecting, off-road vehicle use, and sightseeing.

As with the two previous sites, lands within the study area are largely undeveloped agriculturally, and are primarily used by ranchers with BLM and ASLD grazing permits and/or leases for livestock grazing (41). Land in the study area is divided into two grazing allotments, the Crowder-Weisser and K Lazy B. Note that the study area represents only a portion of the entire Crowder-Weisser and K Lazy B allotments. The qualifications of the Crowder-Weisser allotment are listed below (72); the qualifications of the K Lazy B allotment (60) are in the discussion of agricultural land use for the Western Harquahala Plain site.

- Crowder-Weisser Allotment -
  Range: managed as perennial-ephemeral
  Season of use: year-long
  Class of livestock: cattle and horses
  Base herd qualifications: 25,306 AMU's, the equivalent of 2,260 cows year-long. This base herd qualification was determined using a figure of 97 percent federal range. Existing range improvements are: Crowder Peak Dikes, Coyote Peak Reseeding #1, Coyote Peak Enclosure Fence, Salvation Well, Salvation Well Fence, Cattleguards, Trough and Storage, Windmill, and Corral.

The locations of all existing range improvements, with the exception of the Coyote Peak Reseeding #1, are displayed on Figure 3-15. The Salvation well, windmill, corral, fence, trough, and storage are on one of the sections proposed for the site. Located in the south-central portion of the study area is a series of 3- to 4-foot dikes collecting runoff east of Coyote Peak. The range development is fenced completely and portions are reseeded (73).

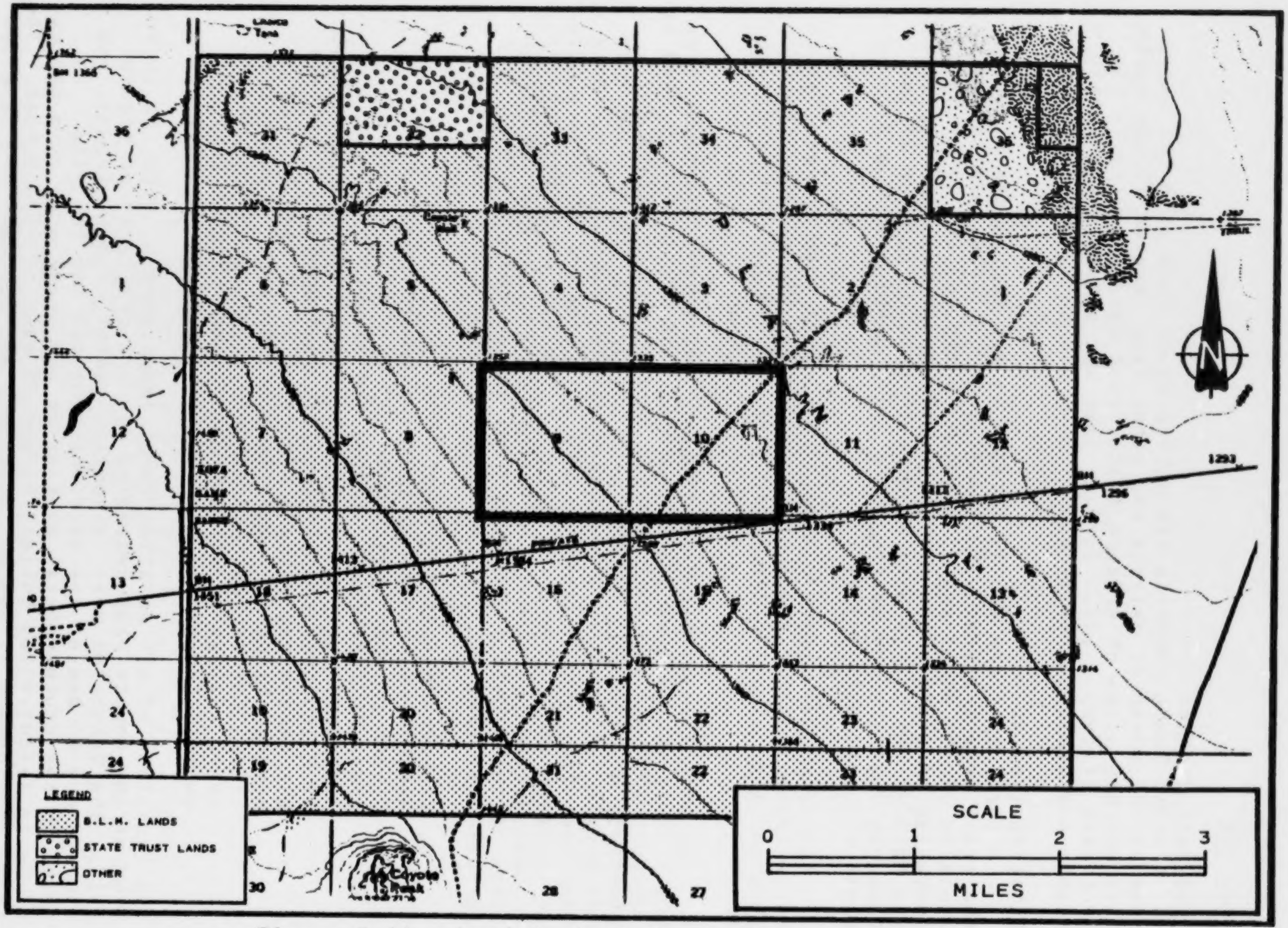

LEGEND
B.L.M. LANDS
STATE TRUST LANDS
OTHER
SCALE
0
1
2
3
MILES
N
Coyote Peak
31
32
33
34
35
36
6
5
4
3
2
1
7
8
9
10
11
12
18
17
16
15
14
13
19
20
21
22
23
24
30
28
27
1293
1296

Figure 3-14. Land jurisdiction at Ranegras Plain site.

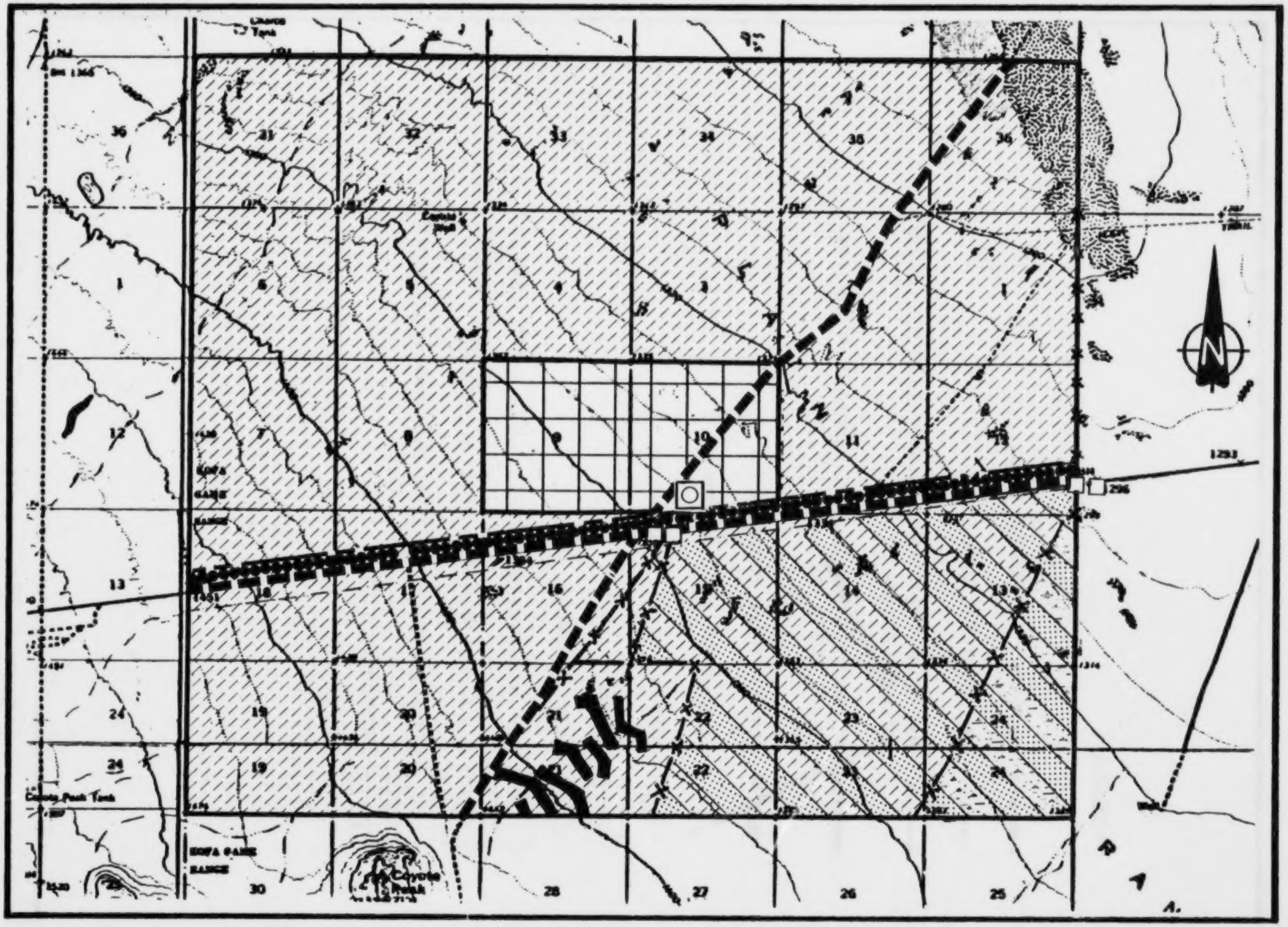

KOFA GAME RANGE
Coyote Peak
Coyote Peak Tank
1293
R
A

Figure 3-15. Existing land use at the Ranegras Plain site.

LEGEND

▪▬▬▪	UNPAVED IMPROVED ROAD
·········	UNIMPROVED ROAD
—— — ·	PALO VERDE-DEVERS 500KV LATTICE TOWER TRANSMISSION LINE
●●●●●●●●	EL PASO NATURAL GAS COMPANY PIPELINE (30", 30", 26")
〰	COYOTE PEAK DIKES #1
○	SALVATION WELL/WINDMILL
□	CORRAL
—x—x	FENCE
□ □	CATTLE GUARD
▒	BLM WILDERNESS STUDY AREA UNIT #2-127
░	K LAZY B BLM GRAZING ALLOTMENT
▨	CROWDER-WEISSER BLM GRAZING ALLOTMENT
⊞	PROPOSED SITE

Figure 3-15a. Legend to Figure 3-15.

Utility land use consists of one existing 500-kV lattice tower extra high-voltage line and the EPNG pipeline intersecting the study area in a general west-to-east direction (Figure 3-15). The Southern California Edison Company transmission right-of-way parallels the EPNG pipeline. The major pipeline corridor located in the central portion of the study area is operated by EPNG (LU-31). For additional information, refer to the discussion of utility land use for the Western Harquahala Plain site.

Two unpaved improved roads are located within the study area. Hovatter Road travels in a southwest-to-northeast direction, and primarily forms connections to specific use areas such as range improvements. The second road is the utility access road which traverses the central study area. One unimproved road is situated in the study area connecting the EPNG access road with Hovatter Road.

Future Land Use--

Future land use for the Ranegras Plain site is the same as discussed for the Western Harquahala Plain site.

Visual Resources

The visual resources assessment was performed for the area located within 3 miles of the site (a total study area of 56 square miles).

A small portion of the northern part of the study area was classified as a visual quality Class C area of high sensitivity (I-10 foreground/middleground distance zone) and assigned a Tentative Management Class III (64). Approximately 60 percent of the study area (including the site) was considered to be Management Class IV because of minimal visual quality and moderate viewer sensitivity. An undisturbed portion of the Kofa Game Range was identified as Management Class II because of high sensitivity in a Class B landscape. Finally, one square mile of the proposed Kofa WSA, and approximately 12 square miles (adjacent to the site) of the Little Horn WSA were identified as Management Class II (2-127). Results are shown on Figure 3-16.

Cultural Resources

Archaeological--

Three sites (two temporary camps and a trail) were recorded within the study area (Table 3-17). While additional sites are likely to exist in the area, their density is anticipated to be low. A synopsis of cultural development in southern Arizona is provided in Appendix K.

Historical--

No historical sites have been recorded within the study area.

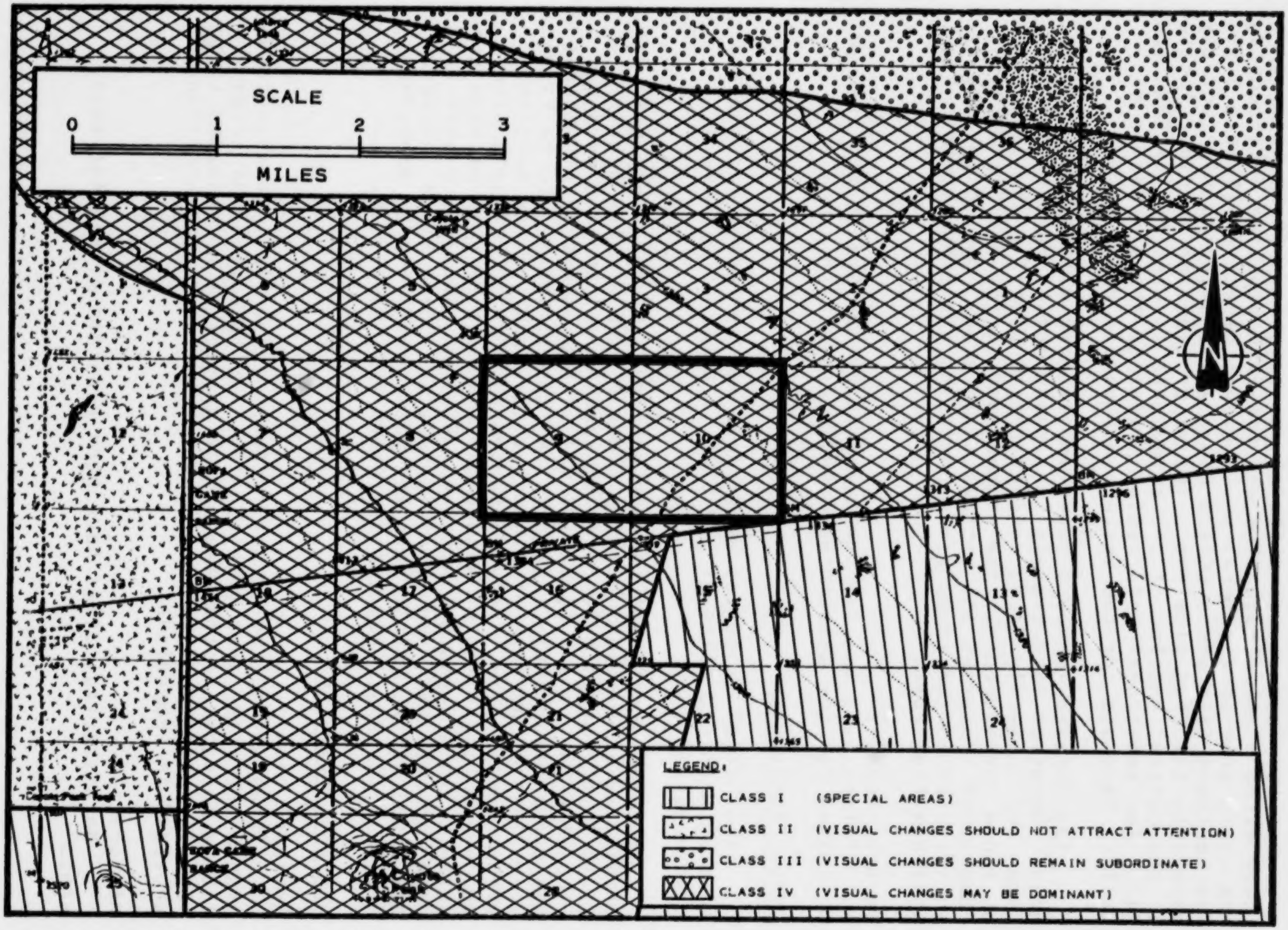

SCALE
0
1
2
3
MILES
N
LEGEND:
CLASS I (SPECIAL AREAS)
CLASS II (VISUAL CHANGES SHOULD NOT ATTRACT ATTENTION)
CLASS III (VISUAL CHANGES SHOULD REMAIN SUBORDINATE)
CLASS IV (VISUAL CHANGES MAY BE DOMINANT)

Figure 3-16. Visual resources within 3 miles of Ranegras Plain site.

TABLE 3-17. ARCHAEOLOGICAL SITE INVENTORY FOR THE RANEGRAS PLAIN

Site Type	Cultural Affiliation	Description
Temporary camp	Unknown	Basalt rock ring, quartzite core and scraper.
Temporary camp	Unknown	Rock ring.
Trail	Unknown	North-south aboriginal trail.

Native American--

The study area located in the Ranegras Plain was also occupied and utilized by the Yavapai, Maricopa, and Pima. As with the Harquahala Plain site, the surrounding elevated areas were of particular importance. The closest of these are the Little Harquahala Mountains, located well beyond the study area. A summary of the Native American cultural resources inventory for the Ranegras Plain site area is given in Table 3-18.

The Ranegras Plain was utilized as a subsistence area. Creosote bush and Umsi (an important medicinal plant) were gathered there by the western Yavapai. The two trail systems which cross the Western Harquahala and Ranegras Plains are the Ehrenberg-Arlington Trail, with associated trail shrines, and the Gila River to Parker Valley Trail utilized by the Panya group of Cocomaricopa.

Further discussion of the area's cultural development and history is provided in Appendices L and M.

Socioeconomics

Setting Summary--

The Ranegras Plain site lies 7-1/2 miles west of the Western Harquahala Plain site discussed earlier. The Ranegras Plain site is located 80 miles from the Phoenix metropolitan area by highway, and 60 miles southwest of Wickenberg. Access to the site is from I-10 at Exit 53, followed by a drive of approximately 6 miles on Hovatter Road to the southwest. The border between Maricopa and Yuma Counties is 19 miles east of the site. The Kofa National Wildlife Refuge is 3 miles from the site, but almost 20 miles along an unimproved road.

Of the cluster of towns located along U.S. Highway 60 mentioned previously, Vicksburg, Vicksburg Junction, Hope, and Harcuvar are within 15 miles of the site. Vicksburg is located 3 miles northwest of Hope on State Highway 72, and consists of a few mobile homes, a bar that is closed, and a few other buildings. As in the other towns in the area, there is no local government. Vicksburg Junction is at the intersection of Vicksburg Road and U.S. Highway 60. Vicksburg Road, an unimproved road, connects Vicksburg and Vicksburg Junction; it then continues south to I-10. Vicksburg junction has a few mobile homes and three structures, with a Baptist church south of the junction on Vicksburg Road.

For a discussion of Hope and Harcuvar, see the discussion on the Western Harquahala Plain.

Population--

Based on the 1980 census data, topographic maps, and field inspection of the study area, estimates of current and projected population within 5, 10, and 15 miles of the site are shown in Table 3-19.

TABLE 3-18. NATIVE AMERICAN CULTURAL RESOURCE INVENTORY FOR THE RANEGRAS PLAIN SITE

Site Type	Site Location	Approximate Miles from Ranegras Plain Site
	RELIGION AND RITUAL	
Trail Shrines	Ehrenberg-Arlington	* Trail
	FOOD AND OTHER RESOURCES	
Sacred Trail	Ranegras Plain	Vicinity
	TRAILS	
Trail	Ehrenberg-Arlington	*
Trail	Gila River to Parker	* Valley

* Precise location not determined in the study.

TABLE 3-19. ESTIMATES OF CURRENT AND PROJECTED POPULATION WITHIN A 5-, 10-, OR 15-MILE RADIUS OF RANEGRAS PLAIN SITE

	1980 Estimated	1985 Projected	1990 Projected	1995 Projected	2000 Projected
5 Miles	5	5	5	5	5
10 Miles	30	31	31	31	32
15 Miles	535	554	563	572	581

Tax Considerations--

The Ranegras Plain site is located in Tax Area Code No. 0300. In 1981, the comprehensive mill levy was $11.89 per $100 of assessed valuation. Commercial property is assessed at 25 percent of the full cash value. Full cash value is defined as 85 percent of the market value.

Employment, Labor Force, and Income--

The discussion of employment, labor force, and income for the Western Harquahala Plain site applies to the Ranegras Plain site.

Tourists and Seasonal Population--

The discussion of tourists and seasonal population for the Western Harquahala Plain site applies to the Ranegras Plain site.

SECTION 4

PROJECTED ENVIRONMENTAL IMPACTS

INTRODUCTION AND ASSUMPTIONS

This section discusses the projected environmental consequences of establishing a hazardous waste management facility at the proposed or alternative sites. Section 1502.16 of NEPA regulations for EIS's directs that this section form the scientific and analytic basis for the comparison of the alternatives described in Section 2.

Potential impacts are based on the representative facility design described in Appendix D. This representative design assumes the facility would be designed to handle wastes generated within Arizona (see Appendix C). It also assumes that the facility would not include incineration or other high technology treatment techniques (see Appendix D). Transportation-related impacts are based on an assumption that approximately 2,300 truckloads of hazardous waste per year would be shipped to the facility from Phoenix and Tucson. This covers approximately 90 percent of the state's waste stream (see Appendix N).

Following each discussion of the potential for impacts on the various resources, mitigative measures are presented which may prevent or alleviate these impacts. These measures would be in addition to the conditions established in the facility permits.

POTENTIAL IMPACTS ON PHYSICAL SETTING

Assessment Approach

The potential physical impacts of the facility on the proposed site were assessed in terms of the disturbance, removal, and/or alteration of the topography, soils, and vegetation, and the consequences of these actions. The suitability of the geologic conditions for development of the proposed hazardous waste management facility was also evaluated.

Mobile Site

Topography and Soils--

The topography over an area of about 58 acres would be substantially altered over a period of 30 years by construction of both waste storage, treatment, and disposal structures and access roads into the site from existing roads. Since this affected area constitutes approximately 9 percent of the total area of the site, this impact would not be significant.

This construction would also result in considerable disturbance of the site's natural vegetation (see subsequent discussion of ecological impacts). As a result, increased wind and water erosion could be anticipated unless disturbed areas were properly stabilized. Following the construction phase, portions of the disturbed land would begin to revert to preconstruction conditions. Some of the topography and soil would remain disturbed for the life of the project and beyond. If stockpiling of soil became necessary (i.e., topsoil for use as cover during closure), such stockpiles would be highly susceptible to erosion.

Geologic Conditions--
Site specific geologic data is limited, but available information indicates that the site's general geologic conditions are suitable for development of the proposed hazardous waste management facility, provided the facility is designed to minimize contact between the wastes and the subsurface environment. More detailed information would be needed to address specific impacts as part of the permit process.

Western Harquahala Plain and Ranegras Plain Sites

The impacts on the geologic environment, topography, and soils at these two sites would be generally similar to those described for the Mobile site. However, the different nature of drainage at these sites (sheet flooding rather than channelized flows) could result in different types of erosion impacts.

Mitigative Measures

Topography and Soils--
More detailed site investigations would be required to better define soils conditions. These investigations should address:

- Engineering properties of subsurface soils (texture, plasticity, permeability, etc.).
- Suitability of soils for construction purposes (moisture-density relationships, remolded permeabilty, reactivity with wastes, etc.).
- Stratigraphy and continuity of site materials.

ADHS would ensure that the facility contractor would, based on the above investigations, construct the facility in a manner that will:

- Minimize soil and vegetation disturbance in adjacent areas.

- Provide soil stabilization measures in areas where disturbance is unavoidable.
- Assure that exterior embankments of earthen structures are constructed to minimize erosion by either wind or water.
- Minimize long-term stockpiling of soils. If stockpiling of soils is unavoidable, the stockpiles should be stabilized to minimize erosion.
- Provide for timely rehabilitation of borrow areas that are developed during facility construction.
- Provide for adequate surface drainage.

Geologic Conditions--
More detailed investigations would be required to better define geological conditions and identify any subsurface indications of seismic (earthquake) activity, so that suitable mitigation measures could be designed for the specific features of the site if necessary. These studies would be performed during or prior to the design phase of the project, once the contractor has been selected by ADHS.

POTENTIAL IMPACTS ON WATER RESOURCES

Assessment Approach

The assessment of potential adverse impacts on water resources was based on available data concerning regional hydrogeology and water use, and on aerial photos. Primary emphasis was placed on the potential contamination of ground water resources. Surface run-off patterns and the potential contamination of cattle watering tanks were also evaluated.

Ground Water

Because of the substantial depth to ground water estimated at each site, contamination of ground water is unlikely except in the event of a long-term leak of large amounts (several thousand gallons) of contaminants from the facility. EPA's facility regulations are intended to prevent such contamination through stringent design and operating standards (see Appendix A). In the event contaminants did leak and reach ground water, the regulations require the owner/operator to take corrective action to prevent the migration of contaminated water away from the facility (for example, by pumping out the contaminated water, treating it, and restoring it to the aquifer).

The specific measures the facility owner/operator would take to meet the requirements of EPA's regulations would be established in the permit to build and operate the facility (see Appendix A). In this section impacts are addressed that are likely to occur if the preventive measures taken by the facility were to fail such that ground water became contaminated and migrated away from the facility site before corrective action were taken. It should be remembered that, given the substantial depth to ground water, it would likely take decades even for a large release of contaminants to reach the water table after leaking from the facility.

Mobile Site--

Calculations based on the average ground water characteristics in the Mobile area (see Section 3), indicate that ground water moves through the subsurface at the rate of approximately 99 feet per year, increasing to 290 feet per year within the cone of depression (the area where pumpage of ground water is greatest). Evidence from USGS studies in the Waterman Wash area indicates ground water moves northwest toward the cone of depression, some 15 miles north of the site.

The community of Mobile, some 6 miles from the site, is located upgradient from the site (i.e., away from the direction of regional ground water flow); thus, its underground water should not be affected by the operation of the facility. Six wells are located 7 to 8 miles north of the Mobile site. These are the closest existing wells downgradient from the facility (i.e., in the direction of regional ground water movement). Assuming an average rate of ground water velocity* in the basin and assuming the ground water moves from the site to these wells, it would take over 370 years for ground water contaminated at the site to reach these wells. Using a more conservative estimate, of a velocity of 135 feet per year†, it would take some 270 years for ground water to travel from the site to the wells (see Appendix F).

These estimates are based on the direct movement of ground water from the site to the wells. If subsurface geologic barriers force the ground water to move in a less direct path, it would take longer for any contaminated water to reach the wells. If the contaminated ground water continued to move towards the cone of depression, it would take some 100 to 150 additional years to migrate to the cone of depression, approximately 15 miles north of the site.

Considering the depth to ground water beneath the site, and the average velocity of ground water movement within the Waterman Wash aquifer, it is likely that it would take several hundred years for any contamination to enter ground water and move to the nearest water supply wells. This slow movement of contaminated water would provide a substantial period of time in which to detect a leak, establish a monitoring program, and take corrective action. Consequently, the likelihood of well contamination is extremely remote. Such an event would take place only if both a significant, long-term failure of the facility safeguards and a failure to detect and correct ground water contamination were to occur.

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* Average velocity is equal to hydraulic conductivity times hydraulic gradient divided by porosity. Hydraulic conductivity is equal to transmissivity divided by saturated thickness.

† Based on the highest recorded transmissivity in the basin.

If such a massive failure did take place, there are numerous variables which would affect the extent of actual risk to public health and the environment. These variables would include the particular types and quantities of wastes released, the specific characteristics of the aquifer between the site and the downgradient wells, the extent and nature of water use at the time the contaminants reached the wells, and the exact concentrations of contaminants in the ground water at the point of withdrawal.

Because of the significant times involved and the qualified nature of available data, it is not possible to project specific public health risks associated with contamination of the aquifer by a facility leak. Exposure of the public to certain types of contaminants that could be handled at the facility may pose a health hazard. If ground water did become significantly contaminated, the public could be exposed either through direct consumption of contaminated water supplies or through consumption of food crops irrigated by contaminated water or meat from animals which have drunk contaminated water. While such exposure generally would not cause immediate (acute) health problems, long-term (chronic) health effects could occur.

It should be noted that the probability that water users will be exposed to ground water which is contaminated at a level which would require public action (an "alert level") is very low. Even if large quantities of contaminants entered ground water beneath the facility, the concentrations of contaminants would likely be very low by the time the contaminated water reached the nearest wells. Many of the contaminants could be expected to interact with the subsurface soil and thereby be removed from the moving ground water. Other contaminants would be diluted over time such that their concentrations in the ground water at the wells would be below alert levels.

Nonetheless, the possibility exists that major long-term failure at the facility resulting in the release of substantial quantities of contaminants into the subsurface beneath the site could, over a probable period of several hundred years, result in the migration of contaminants to areas of heavy ground water use within the basin. Continued use of the contaminated water in the area could pose a potential health hazard to the population using that water.

Widespread contamination of the aquifer could require either extensive treatment of the ground water to remove contaminants, provision of alternative water supplies, or relocation of the users of the aquifer. Since ground water is the only current supply of water in the basin, provision of alternative water supplies from outside the area could be very costly.

Western Harquahala Plain Site--

The nearest well downgradient from the Western Harquahala Plain site is located 3.75 miles to the southeast. Calculations based on average ground water characteristics in the area (see Section 3) show that it would take between 2,700 and 11,000 years for contaminated ground water to move from the site to the well. The potential public health impacts of a contaminated aquifer are the same as at the Mobile site, although the estimated times for such impacts are much longer at the Western Harquahals site.

Ranegras Plain Site--

Based on the assumptions stated in Section 3 concerning ground water at the Ranegras Plain site, and the location of the nearest downgradient well (Bouse Wash Rest Stop), contaminated water originating at the site would take between 2,250 and 6,750 years to travel the 5.25 miles to the well. Between 3,750 and 11,250 years would be needed for a contaminated plume of ground water to move from the site 8.75 miles to Hope City, the only other known domestic water supply well in the area.

The potential public health impacts are the same as at the Mobile site, although the estimated times for such impacts are much longer at the Ranegras Plain site.

Mitigative Measures--

The federal standards allow the permit applicant flexibility in designing the facility, as long as ground water is adequately protected.* The standards focus on the following design options for surface impoundments, waste piles, and landfills: (a) use of a single liner, with a ground water monitoring system to detect contaminants in the ground water at the facility, or (b) use of double liners, with a leak detection system between the liners to detect movement of liquids through the first liner. Ground water monitoring is not required for the double liner/leak detection system, since leaks could be detected and corrected before contaminants reached ground water. If a leak were detected but not repaired, the facility owner/operator would be required to monitor the ground water and, if potentially harmful levels of contamination were found, take corrective action.

* An exemption from liner requirements is allowed if EPA finds, based on a demonstration by the owner or operator, that alternate design and operating practices, together with location characteristics, will prevent the migration of any hazardous constituents into the ground water at any future time. See, for example, 40 CFR 264.221(b).

Actual design of the ground water protection system would depend on the specific hydrogeologic characteristics of the subsurface under the chosen site as well as the overall design of the facility. Available information on the proposed sites suggests that using double liners with a leak detection system, or some other combination of leak detection methods, would be more appropriate than relying solely on a ground water monitoring system to detect the release of contaminants from the facility. Because of the substantial depth to ground water and the normally low moisture content of the desert soils, it is possible that the subsurface beneath the facility would be able to absorb a great amount of liquid before the liquid could reach ground water.* It could be many decades, then, before ground water monitoring could detect the release of contaminants from the facility.

There are several methods that could be used to detect the movement of liquid wastes or leachate from the facility. These include:

- Leak detection as part of the impoundment or landfill design. This would involve use of the double liner system. Between the two liners, there could be installed a system capable of collecting liquids and conveying them to a point or points where they could be measured and collected for sampling and/or retrieval.

- Liquid mass balance for impoundments. For this, the operator could maintain records on the amount of liquid discharged to the impoundments, maintain meteorological records to determine evaporation from the impoundments, and maintain continuous measurements of the amount of liquid in the impoundments.

- Unsaturated zone monitoring. For this, suction lysimeters could be installed beneath or around the facility. (Lysimeters are devices designed to retrieve a sample of liquid from the soil moisture in the unsaturated zone.) Boreholes could be installed around the facility. These would be capable of accomodating various types of geophysical instruments designed to measure changes in moisture content.

- Ground water monitoring. This type of monitoring could be used even if the double liner system were put into place. For this, monitoring wells would be installed both upgradient and downgradient. The quality of the existing ground water would be determined from samples from the upgradient wells and initial samples from the downgradient wells. An on-going monitoring program would sample in order to detect changes in water quality over time.

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* The capacity of the subsurface to absorb contaminated liquids leaking or leaching from the facility cannot be determined at this time because of inadequate information about the hydrogeology at each site, and lack of sufficient scientific knowledge about the way in which many hazardous wastes would act in the subsurface.

The facility contractor would be required to obtain site-specific hydrogeologic data. ADHS would work with the contractor in the early stages of designing the facility to ensure the design provides adequate protection of ground water and the capability of detecting movement of hazardous constituents out of the facility.

Surface Waters

The main pathway of surface water contamination is rain waters flowing through the sites. The EPA standards generally require that facility units be protected against flows during peak discharge of at least a 24-hour,* 25-year storm. Consequently, the facility would have to be designed to divert heavy rain water flow away from areas used for treatment, storage, or disposal of wastes. In addition, the facility would have to be designed so that liquids collected within the facility (rain water, spilled liquids, etc.) are contained on the site. The following discussion is based on a facility designed to divert rain waters in accordance with these requirements.

Mobile Site--

Adequate protection against storm waters would be a key concern at the Mobile site, since the area is subject to intense run-off from occasional storms. Inadequate protections against storm water run-off cold result in washout of the facility, in which case the flood waters would be expected to carry contaminants down to Waterman Wash and eventually into the Gila River. The concentrations of hazardous constituents in the water would likely be very dilute by the time it reached the Upper Rainbow Valley area and entered the Gila River. Nonetheless, the presence of contaminants could pose a significant health hazard. Under these circumstances, the requirement to protect the facility from a 25-year storm could be inadequate.

The diversion of run-on waters would increase the flow in other washes. Construction activities at the site could also result in blockage of existing washes and further diversion of storm water flows into nearby channels or erode new channels. The extent of these impacts would be expected to be limited to the immediate vicinity of the site, probably no more than the site and buffer zone. The flow of surface waters into Waterman Wash downstream would not be affected. Diversion of surface waters away from the facility, however, could increase the flow of rain waters into or around the Northwest Tank. Such an increase could exceed the holding capacity of the tank and threaten its structural integrity.

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* See, for example, 40 CFR Parts 264.251(c), 264.273(c), and 264.301(c) and the Federal Register, July 26, 1982, pages 32360 et seq.

Western Harquahala Site--

The flow of rain water from the surrounding watershed is blocked by the CAP canal. Consequently, the quantities of water diverted around the facility at this site would not be expected to be large. No impact would be expected on the cattle tank south of the site, since diverted run-off would tend to flow southwesterly through the wash which is located between the site and the tank.

A potential flooding problem could arise if the CAP canal were to overflow or wash out due to extremely intense storms. Overflow from the canal could flood the facility, carrying contaminants into Bouse Wash. The concentrations of hazardous constituents in the flood waters would be expected to become dilute downstream from the facility. Nonetheless, a potential health hazard could exist downstream. Overflow of the CAP, however, is not likely since the aqueduct is protected from run-on by adjacent floodwater retention and diversion dams. The design also provides for the controlled release of canal waters where necessary.

Ranegras Plain Site--

The effects of diverting storm waters at this site would be expected to be minimal. The area is characterized by sheet runoff, and some of that is already diverted away from the site by a drainage ditch to the south.

Mitigative Measures--

At the Mobile site, ADHS would require the facility contractor to design the facility so as to protect against a 100-year storm rather than a 25-year storm, using berms, ditches, dikes, or other hydraulic structures as needed to protect the facility against flooding and washout. Drainage patterns in the area and appropriate surface water controls should be carefully evaluated and incorporated in the facility design.

If the facility were to be placed at the Western Harquahala Plain site, ADHS would require the contractor to evaluate the potential for flooding caused by CAP overflow. Appropriate protective measures, such as dikes, berms, etc., would be incorporated into the facility design.,

The specific design of rain water diversions and containment systems would be addressed in the facility permit. The facility contractor would be required to submit data with the permit application to substantiate the effectiveness of the design. In addition, ADHS would work with the contractor to minimize or avoid adverse impacts on the Northwest Tank (Mobile Site) or on other potentially affected areas which might be identified in the process of designing or constructing the facility.

POTENTIAL IMPACTS ON AIR QUALITY

Assessment Approach

The impact on air quality due to construction and operation of the hazardous waste management facility was assessed by dispersion modeling and "screening" analysis (see Appendix G). Table 4-1 shows the estimated emission rates for selected pollutants originating from construction activities at the site and the estimated rates for individual compounds in the landfarm. These rates were used in the dispersion modeling analysis. Maxima were established by considering various other wind sectors. A dispersion modeling exercise is required to relate emissions to ambient air quality. Due to its applicability to complex terrain situations, the short-term (screening) mode of the VALLEY model was used to estimate ambient concentrations downstream. The annual impact was computed by using VALLEY in the long-term mode.

Mobile Site

Scoping participants were concerned with the air quality impacts on nearby communities. Therefore, the analysis of air quality impacts assumes the wind blows toward the nearest community, Mobile. Results of the modeling analysis are summarized in Table 4-2. Individual impacts for the various processes are discussed below.

Total Suspended Particulates (TSP)--
As noted in Table 4-2, construction activity at the proposed site is expected to add 10 ug/m^3 TSP (e.g., dust, dirt) to the ambient concentrations. Since the 24-hour and annual TSP standards are already exceeded in the area (see Table 3-3), the construction activity is expected to add to the problems. Additions to the ambient TSP concentrations near Estrella and Mobile are computed to be less than 5 ug/m^3 and 1 ug/m^3, respectively.

Dust emissions resulting from tilling organic wastes into the landfarm were estimated at only 4 tons/year (see Appendix G). This emission rate is 50 times less than that anticipated during the construction of the facility.

The results presented are probably conservatively high since particulate deposition was not considered in the modeling analysis.

Volatile Organic Compounds (VOC) Emissions--
The estimated annual emission rates for VOC's from the impoundments, landfarm, and landfill are given in Table 4-1. EPA's regulations for the Prevention of Significant Deterioration (PSD) of air quality require that any source of emissions greater than

TABLE 4-1. POLLUTANT EMISSION RATES USED IN MODELING ANALYSIS

Process/ Pollutant	Emission Rate (g/sec)	Emission Rate (tons/year)
Construction:		
TSP - short term	7.70	
TSP - annual average	5.60	
Landfarm:		
Allyl Alcohol	0.27	
Dimethyl Sulfate	0.01	
Formic Acid	0.37	
Phenol	0.01	
Total Volatile Organic Compounds:		
Surface impoundment		40
Landfarm		27-161*
Landfarm and solvent recovery		42-101*
Landfill		40-157*

* These are ranges of estimated emissions. See Appendix G.

TABLE 4-2. AIR QUALITY IMPACT OF THE MOBILE SITE

Process/ Pollutant	Averaging Time	Standard* (ug/m^3)	Maximum Additional Conc. Expected (ug/m^3)
Construction:			
TSP - short term	24 hr	150	10
TSP - long term	Annual	60	10
Landfarm:			
Allyl Alcohol	8 hr	5,000 (16.7)†	7
Dimethyl Sulfate	8 hr	5,000 (16.7)	<1
Formic Acid	8 hr	9,000 (30.0)	9
Phenol	8 hr	19,000 (63.3)	<1

* With the exception of TSP, the standard concentrations are OSHA's permissible exposure limits (PEL). Entries for TSP are the secondary National Ambient Air Quality Standards, which are set by EPA to protect general air quality.

† PEL divided by 300. See text for discussion.

250 tons/year be reviewed. However, fugitive emissions (i.e., emissions which could not reasonably pass through a stack, vent, or functionally equivalent opening) are not considered in determining the applicability of the PSD requirements. EPA has not determined whether emissions from the facility would be considered fugitive emissions. If they are not defined as fugitive, a PSD permit would be required. If they are, a PSD permit would probably not be required, since the only other source of nonfugitive emissions, the solvent recovery operation, would be expected to emit well under 250 tons/year. The facility contractor would need to contact EPA and ADHS before beginning construction for a determination on the applicability of the PSD requirements.

RCRA does not require a treatment, storage, and disposal facility to estimate airborne emissions. As explained in Appendix G, the only other EPA regulation which may apply to the facility is the emission standard for asbestos, which specifies that "there shall be no visible emissions" from waste disposal sites (40 CFR 61.25).

Emissions of Potentially Toxic Compounds--

Surface impoundments--As noted in Appendix G, hazardous emissions from the surface impoundments probably will be insignificant, given the types of wastes expected to be treated in the impoundments. Should any volatile organic compounds be emptied into the impoundments, volatile emissions are to be expected and could reach 40 tons/year (see Table 4-1).

In addition, the possibility exists that the mixing of acid and alkali wastes could generate heat, thus fueling side reactions or the evolution of organics or toxic compounds into the air (74). Such reactions may prove to be negligible or nonexistent under normal operating conditions, but the possibility of such emissions should be recognized.

Landfarm--The estimated ambient concentrations of four potentially toxic compounds which may be treated in the facility are shown in Table 4-2. There are no emissions or ambient standards for any of these compounds, making it difficult to assess the health or environmental hazards that might be associated with such concentrations. The Permissible Exposure Limits (PEL's) for these compounds are given in Table 4-2, and it is clear that the calculated ambient concentrations fall far short of these limits. However, this comparison does not necessarily prove absence of a health hazard, since comparing PEL's with ambient levels for any given compound is not necessarily justifiable. PEL's are intended to provide limits for the workplace, are meant for an 8-hour exposure period, and are set for healthy workers. Shen (75) mentions that a "numerical value ranging from 1/100 to 1/300 of the TLV value[*] has been generally used as a guide for ambient air quality standards." It is evident from Table 4-2 that the ambient levels anticipated for the four compounds chosen are less than the PEL's scaled down by a factor of 300.

Landfill--In general, liquid organic compounds are "solidified" before being placed into a landfill by mixing with compounds such as dust, soil, or garbage. The goal of this mitigation measure is to reduce the possibility of liquid organics seeping into the ground water, but it is possible that such treatment may lower the volatility of treated organics and thus indirectly reduce organic emissions.[†] However, other landfills with organic wastes show high emission rates of organics, many of which are potentially hazardous compounds (76). While the experience at other facilities may not be applicable to the proposed Arizona facility, it does suggest a potential for organic and/or toxic emissions from the landfill.

Western Harquahala Plain and Ranegras Plain Sites

The results of the modeling analysis for the Western Harquahala Plain and Ranegras Plain sites, summarized in Table 4-3, are practically identical to those presented for the Mobile site. The ambient levels would be expected to be well below TSP standards and PEL's.

Mitigative Measures

ADHS would ensure that the contractor minimizes the impacts of fugitive dust created during excavation of soil on site or by traffic on unpaved roads. The following control measures could be used:

- Watering disturbed areas at the site.
- Ceasing construction during high wind periods.
- Using dust suppressants to reduce traffic dust until the access road is paved.

To control fugitive dust during facility operation, ADHS would ensure that the contractor do the following:

- Revegetate areas disturbed during construction to desert conditions.

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[*] Threshold limit values (TLV) are generally very close to PEL's for any given compound.

[†] ADHS would encourage the facility contractor to use advanced solification/fixation technology for all liquid wastes prior to landfilling. As a result, the organic emission or leaching would be minimal.

TABLE 4-3. AIR QUALITY IMPACT OF THE WESTERN HARQUAHALA PLAIN AND RANEGRAS PLAIN SITES

Process/ Pollutant	Averaging Time	Standard* (ug/m^3)	Max. Conc. Expected (ug/m^3)
Construction:			
TSP - short term	24 hr	150	11
TSP - long term	Annual	60	9
Landfarm:			
Allyl Alcohol	8 hr	5,000 (16.7)†	10
Dimethyl Sulfate	8 hr	5,000 (16.7)	<1
Formic Acid	8 hr	9,000 (30.0)	14
Phenol	8 hr	19,000 (63.3)	<1

* With the exception of TSP, the standard concentrations are OSHA's permissible exposure limits (PEL). The entries for TSP are the secondary National Ambient Air Quality Standards which are set by EPA to protect general air quality.

† PEL divided by 300. See text for discussion.

- Pave the access road between Mobile and the site.
- Pave main areas of vehicle travel within the facility.
- Water or introduce chemical dust suppressants into overburden storage piles.
- Water or introduce chemical dust suppressants into landfill areas.
- Water the landfarm area.
- Cap and revegetate closed landfill areas as required by the permit.

ADHS and the facility contractor should carefully evaluate the potential for hazardous emissions from the facility. Proper operation of the facility could insure minimal impacts. For example, acids and alkalis can be neutralized prior to introduction into the surface impoundment. Once neutralized, the impoundment would essentially contain a brine (salt) solution, and subsequent emissions into the air would be insignificant. Evaluation of potential methods for solidifying or stabilizing fluids should consider their effect in reducing emissions.

POTENTIAL IMPACTS ON PUBLIC HEALTH AND SAFETY

Assessment Approach

Assessment of the risk associated with the transport of hazardous wastes was limited to the transport routes from the Phoenix and Tucson areas to each of the three sites. The risk analysis involved determination of likely routes from these two metropolitan areas to the sites, accident rates, the probability of an accident involving a hazardous waste shipment, and the population risk factor. Details of the risk analysis are given in Appendix N.

The assessment of noise and odor impacts, Valley Fever potential, and spill risks during operation relied on secondary sources of information, particularly studies that had measured these impacts at similar hazardous waste management facilities. This information was analyzed and applied to those conditions that now exist at the proposed and alternative sites.

The assessment of noise impacts considered two types of noise: facility noise due to construction and operational activities, and traffic noise on access roads into the sites. Information on noise levels at operating facilities was obtained from two studies of existing hazardous waste facilities (77, 78). Typical noise levels from trucks and automobiles was obtained from other published sources (29, 79, 80). A summary of this information is presented in Appendix O.

The information presented in Appendix O is assumed to apply to noise levels generated by equipment at the facility and by traffic to and from the facility. The noise impacts at each site would depend on the nature of the background sound and the distance from the noise source to the sound receivers.

Emergencies During Operation

Mobile Site--

Based on the experience of a California facility, approximately one on-site spill occurs for every 10 million gallons of waste delivered to the facility (81). Based on these data, a probability of 0.5 spills per year could be expected from facility operations (77, 78).

The impacts of an on-site spill or emergency would depend on such factors as the specific hazardous substances involved, the nature of the incident, weather conditions. Spilled liquids would volatilize or be absorbed rapidly into the dry soil, and would not be expected to penetrate to ground water. Volatilization of liquids or fires could result in the release of contaminants into the air.

Western Harquahala Plain and Ranegras Plain Sites--

The assessment of spill risks at the Western Harquahala Plain and Ranegras Plain sites is identical to that given for the Mobile site.

Mitigative Measures--

EPA and state standards require emergency preparedness and contingency plans at all hazardous waste facilities (see Appendices A and B). These plans become part of the permit. ADHS would work closely with the facility contractor in developing plans for this facility.

Among measures that could be considered in developing preparedness and contingency plans are the following:

- Where appropriate, grade waste handling areas to a centralized collection point for spilled liquids.
- Incorporate an emergency spill collection and treatment system as part of the overall engineering design.
- Monitor to ensure early warning of released chemicals.
- Protect employee health and safety with protective clothing and equipment, training, health monitoring, and limitation of certain wastes to specific areas and for specific handling times.

Risks from Transporting Hazardous Wastes

Mobile Site--

The potential for accidents from the shipment of hazardous wastes is estimated to be low, ranging from 0.01 to 0.02 accidents per year along three alternative routes from Tucson to the Mobile site. As shown in Table 4-4, Route B has the lowest probability of an accident occurrence.

Shipments of the hazardous wastes from Phoenix to the Mobile site would have a higher probability of accidents than from Tucson because of the larger volume of traffic near the Phoenix area. Table 4-5 shows that accident probabilities may range from 0.02 to 0.13 accidents per year, with Route C having the lowest rate.

The shipment of hazardous wastes from Phoenix and Tucson poses risks to populations residing along potential routes, and to communities near the Mobile site. These risks include explosions, fire, and spills of materials which may be highly toxic.

The population risk factors, as shown in Table 4-6, vary as a function of the accident probabilities and the size of the population residing in the potential impact areas located along the routes. Route B, from Tucson to the Mobile site, has the lowest population risk compared to the two other routes, and poses less risk to the population. Route C offers the lowest population risk in shipping hazardous waste from Phoenix to the Mobile site.

Figure 4-1 shows communities at risk from a possible transportation emergency, and the communities which have emergency equipment. The population at risk from Tucson to the site exceeds 55,000 people along feasible shipment routes. The route from Phoenix to the Mobile site would place over 100,000 persons at risk from a transit-related accident.

In determining transportation-related spill risks, other considerations should be included, such as special populations at risk (e.g., schools located near or along potential routes) and the existing conditions of access roads to the sites. Schools located in the communities of Maricopa and Mobile near the major routes may be considered as special cases of populations at risk. Visibility problems may also result on existing access roads to the sites due to heavier traffic.

The access road outside Maricopa is deeply cut with banks 2 to 5 feet high reducing road visibility at some places. Road visibility is further reduced because north/south drainage patterns crossing the road create a "roller coaster" effect.

Western Harquahala Plain Site--

The probability of an accident during shipment of wastes from Tucson to the Western Harquahala Plain site is estimated to be 0.05 accidents per year (Table 4-7). The probability of an

TABLE 4-4. ASSESSMENT OF HAZARDOUS WASTE TRANSPORTATION RISK: TUCSON TO THE MOBILE SITE

Route	Highway Segment	Total Miles	Accident Rate (acc/ 12000 vm)	Accident Probability Hazardous Waste Transport (acc/yr)	State of Arizona Accident Probability* (acc/yr)
A	Tucson - Arizola-Mile Post 151 (I-10). West to Casa Grande. Casa Grande - Maricopa site (Maricopa Rd).	107	0.0006	0.02	0.017
B	Tucson - Arizola (I-10). Arizola - Casa Grande-Maricopa - site (Maricopa Rd.).	103	0.0004	0.01	0.02
C	Tucson - Arizola (I-10). Arizola - Francisco Grande (I-8 and Interchange 167). Francisco Grande to Stanfield (Hwy. 84). Stanfield - Maricopa - site (Maricopa Rd.).	107	0.0006	0.02	0.017

* Accident rate of 0.0005/1,000 miles based on state commercial vehicle accident rate.

Source: State of Arizona, Department of Transportation, 1982.

TABLE 4-5. ASSESSMENT OF HAZARDOUS WASTE TRANSPORTATION RISK: PHOENIX TO THE MOBILE SITE

Route	Highway Segment	Total Miles	Accident Rate (acc/1,000 vm)*	Accident Probability Hazardous Waste Transport (acc/yr)	State of Arizona Accident Probability (acc/yr)†
A	Phoenix-Chandler-Arizola-(I-10). Arizola-Casa Grande-Maricopa-Site (Maricopa Rd.).	93	0.0004	0.07	0.09
B	Phoenix-Chandler-Exit 194 (I-10). Exit 194-Casa Grande-Stanfield (Hwy 84). Stanfield-Maricopa-Site (Maricopa Rd.).	107	0.0006	0.13	0.11
C	Phoenix-Chandler-(I-10). Chandler-Maricopa-Site (Maricopa Rd.).	42	0.0003	0.02	0.04

* VM = vehicle miles.

† Accident rate of 0.0005/1,000 miles based on state commercial vehicle accident rate.

Source: State of Arizona, Department of Transportation, 1982.

TABLE 4-6. POPULATION RISK OF TRANSPORTING HAZARDOUS WASTE TO THE MOBILE SITE ALONG ALTERNATIVE ROUTES*

	Route	Exposure Miles	Hazardous Waste Accident Probability (acc/yr)	Population of Impact Area	Population Risk Factor
Tucson to Site	A	107	0.02	55,350	1,101
	B	103	0.01	55,950	559
	C	107	0.02	55,550	1,111
Phoenix to Site	A	93	0.07	133,030	9,312
	B	107	0.13	132,400	17,212
	C	42	0.02	104,410	2,088

* See Appendix N for more detail.

	COMMUNITY AT RISK											
	PHOENIX	TEMPE	CHANDLER	GILA BEND	MOBILE	MARICOPA	SACATON	CASA GRANDE	ARIZONA CITY	ELOY	MURANA	TUCSON
SITE EMERGENCY				●	●	●						
TRANSIT EMERGENCY												
FROM PHOENIX	◉	◉	●		●	●	●	●				
FROM TUCSON					●	●		●	●	●	●	◉

● INDICATES POTENTIAL EXPOSURE

○ INDICATES AVAILABILITY OF EQUIPMENT TO BE UTILIZED FOR HAZARDOUS WASTE INCIDENTS

Figure 4-1. Communities at risk from possible hazardous materials incidents for the Mobile site.

TABLE 4-7. ASSESSMENT OF RISK DURING TRANSPORTATION OF HAZARDOUS WASTES TO THE WESTERN HARQUAHALA PLAIN AND RANEGRAS PLAIN SITES

Route	Highway Segment	Total Miles	Accident Rate (acc/1,000 vm)*	Accident Probability Hazardous Waste Transport (acc/yr)	State of Arizona Accident Probability (acc/yr)†
Tucson					
A	Tucson-Gila Bend-(I-10 & I-8). Gila Bend-Buckeye-sites (Hwy 85 & I-10).	242	0.0006	0.05	0.04
B	Tucson-Phoenix-Sites (I-10)	222	0.0007	0.05	0.03
Phoenix					
A	Phoenix-Avondale-Buckeye (Buckeye Rd.). Buckeye-site (I-10).	110	0.0008	0.18	0.11

* VM = vehicle mile.

† Accident rate of 0.0005/1,000 miles based on state commercial vehicle accident rate.

accident on the route from Phoenix to this site is greater (0.18), reflecting the considerable length of the route and the relatively high accident rates between Buckeye and Phoenix.

Twenty communities along the transit routes to this site in Yuma County (seven of which are near the site) may experience a hazardous waste incident. Along I-10, from Phoenix to the Yuma sites, over 100,000 persons are at risk, and from Tucson, the population at risk ranges from over 60,000 persons to over 150,00 persons (Table 4-8).

The existing access road between the site and I-10 follows the area's drainage pattern coupled with shallow road cuts; this allows drivers good road visibility over the short distance.

Figure 4-2 shows the communities which may be at risk from a hazardous materials emergency that would occur either at the site or in transit to the facility. The potential for spills into the CAP Canal presents a special hazard, as users of CAP water downstream could be at risk should a spill occur where I-10 crosses the canal and not be discovered before contaminated water reached the users. However, the probability of a spill into the CAP canal during actual crossing, or within a mile of the canal is extremely low because the trucks are in the area for a very short time.

Ranegras Plain Site--

The probability of an accident during shipment of wastes from Tucson or Phoenix to this site is identical to that given for the Western Harquahala Plain site.

Population risk assessment for this site is identical to that given for the Western Harquahala Plain site.

Access from Interstate 10 crosses only three of four major washes. Road visibility would not be a problem, as this road has shallow road cuts (approximately 1 to 2 feet).

Mitigative Measures--

The following actions would be taken to minimize the frequency of transit-related accidents and reduce the population at risk:

- Arizona's Law (ARS 36-2800) requires transportation routing regulations to be promulgated. In designing transit routes, ADHS would take into consideration the frequency of accidents and the number of people at risk.
- ADHS would work with the Arizona Division of Emergency Services (DES) to make any necessary revisions to the State Emergency Response Plan, the document which outlines the roles of federal, state, and local agencies in the event of transit emergencies.

TABLE 4-8. POPULATION RISK OF TRANSPORTING HAZARDOUS WASTES TO THE WESTERN HARQUAHALA PLAIN SITE

	Route	Exposure Miles	Hazardous Waste Accdent Probability (acc/yr)	Population of Impact Area	Population Risk Factor
Tucson to Site	A	242	0.05	60,225	3,011
	B	222	0.05	225,000	11,250
Phoenix to Site	A	105	0.18	103,415	18,615

	COMMUNITY AT RISK													
	BENDEN	TONOPAH	BUCKEYE	AVONDALE	PHOENIX	TEMPE	GUADALUPE	SACATON	COOLIDGE	CASA GRANDE	ARIZONA CITY	ELOY	MARANA	TUCSON
SITE EMERGENCY	●													
TRANSIT EMERGENCY														
FROM PHOENIX	●	●	◉	◉	◉									
FROM TUCSON	●	●	◉	◉	◉	◉	●	●	●	●	●	●	●	◉

● INDICATES POTENTIAL EXPOSURE

○ INDICATES AVAILABILITY OF EQUIPMENT TO BE UTILIZED FOR HAZARDOUS WASTE INCIDENTS

Figure 4-2. Communities at risk from possible hazardous materials incidents for Western Harquahala Plain and Ranegras Plain sites.

- ADHS would assist DES in briefing agencies or departments that could be called upon to respond along these routes regarding their role in incidents involving hazardous wastes, according to the Emergency Response Plan.
- The facility contractor would work with the county highway departments to ensure that improvements made in access roads consider safety concerns raised in this EIS.
- ADHS would encourage waste haulers to limit particularly hazardous loads to those times of the day and weather that are likely to minimize the risk of a transit accident.

Off-Site Emergency Response

Mobile Site--

As mentioned above, a total of 14 communities could be exposed to a hazardous waste incident if the facility were developed at Mobile. The communities near the site are most at risk from a hazardous waste incident, with two notable exceptions. The cities of Phoenix and Casa Grande are more likely to experience transit emergencies than other cities along potential transit routes, due to greater traffic loads in these areas.

Although some emergency planning is apparent, an integrated system capable of responding to a major hazardous waste incident (particularly one which occurs outside a major metropolitan area) has not been established. The four affected counties also appear to lack formal preparedness activities with respect to hazardous waste incidents. While there are some county plans, the extent to which they are collaboratively developed or implementable is unknown, largely because these plans have not been tested.

The Arizona Division of Emergency Services (DES) is responsible for developing a state response program to deal with hazardous materials incidents. The approach is to support local areas through training assistance and technical expertise, while DES develops and reviews state emergency response plans. The State of Arizona has adopted an interim Hazardous Materials Emergency Response Plan, but the system may still be inadequate for an effective response because of the low level of local training and equipment and the time it may require for a coordinated state response.

The operating principle of the Response Plan assumes that local areas would respond first on the scene and take protective actions. If the event exceeds the response capabilities of local areas, the Arizona Department of Public Safety (DPS) would be called in to coordinate the state response. DPS is the lead agency for response activities by state government personnel to hazardous materials emergencies. ADHS is responsible for responding to spills involving potential environmental hazards to public health and the ultimate disposal of spilled materials.

If state resources are needed, the plan envisions six safety specialists (Commercial Vehicular Safety Specialists from DPS) as on-site response coordinators. These specialists are located in different parts of the state and have received specialized training in hazardous materials. If called upon, these coordinators would determine the resources needed to manage the problem and would coordinate local and state activities. The state response forces consist of designated specialists from a number of regulatory agencies, depending on the circumstances of the emergency.

Five areas of response resources have been assessed for hazardous waste emergencies. These are outlined as follows:

Response Resource	Assessment
Personnel	County governments lack trained personnel in rural areas. Fire and police resources are in short supply and personnel have little training in hazardous materials. Since they would likely be the first to arrive on scene, even immediate response tasks may be difficult to perform. The State Emergency Response Plan states that the Department of Public Safety will provide resources when the emergency exceeds local capabilities. Six on-site coordinators are available from DPS to manage the response and to call in both state and federal experts in depending on the circumstances of the emergency. The DPS is also responsible for state response communications. The coordinators and are experts in the area of hazardous material and are trained in response organization.
Equipment	Specialized equipment is not routinely available. The State Division of Emergency Services has long-range plans to equip the counties on a priority basis to handle hazardous materials incidents.

Response Resource	Assessment
Field Emergency Medical Capabilities	The rural areas have generally insufficient resources for medical transportation and medical response to major accidents. Outside of the metropolitan areas, only Buckeye and Casa Grande have limited medical transport capabilities.
Availability of Communication Channels	A number of small rural volunteer fire departments have no communication capabilities, once at the scene.
Access to Technical Information	Most organizations that provide technical information on chemical hazards and handling measures require the names of pure chemicals. Information concerning wastes and/or spills is not as readily available.

Almost all nonmetropolitan communities have only a minimal capability to respond to a hazardous waste incident with appropriate emergency equipment, communications, and personnel, including medical personnel. The communities near the proposed site lack effective response capabilities. Although it has the largest team of hazardous materials specialists in the state, personnel based in Phoenix could also become overtaxed, as recently illustrated when two incidents occurred at the same time (82).

Western Harquahala Plain and Ranegras Plain Sites--
The description of emergency response for these two sites is identical to that given for the Mobile site.

Mitigative Measures--
Once a hazardous waste incident has occurred, the ability to limit the severity of its effects on public health and safety relies on response capabilities. The mitigative measures covered herein are focused on adequately preparing public safety agencies to handle incidents once they have occurred. These include acquisition of equipment, personnel training, and incident alert systems.

Equipment acquisition--ADHS would continue to work with DES in upgrading the state's Emergency Response System with the goal of ensuring that fire departments or hazardous materials teams at key points along the transit routes would be adequately equipped or have access to adequate equipment. ADHS would involve the facility contractor in emergency planning and in emergency response assistance to the extent permitted in its negotiated contract.

Personnel training--ADHS would continue to work with DES in securing two types of personnel training needed to improve response capabilities: recognition training and hazardous chemicals management.

Recognition training--ADHS and DES would seek to establish a training program in recognizing and reporting hazardous materials incidents for firefighters and peace officers in near-site communities and in communities or jurisdictions along the transit routes. This is the primary type of training that has been given to firefighters in the cities of Phoenix and Tucson.

Hazardous chemicals management--ADHS and DES would work to establish a more extensive training program in management of hazardous chemicals. This training could be reserved for identified hazardous materials specialists or teams in those communities or areas provided with special chemical equipment.

In interviews with key personnel, insufficient funding for either type of training was a major reason given for a lack of expertise, especially in volunteer fire departments. ADHS would work with DES to (a) seek resources to provide training, (b) assess the training needs of local emergency response personnel and to inform them of training opportunities, and (c) establish training programs once resources were secured.

Incident alert systems--Interviews with public safety specialists indicate that although the state and some counties have hazardous materials response plans, there was some confusion regarding coordination, on-site authority, and resource availability. ADHS would work with DES to ensure the State Emergency Response Plan is distributed to relevant agencies, that training is provided, and the plan is tested.

Valley Fever

Mobile Site--

There is some evidence to suggest that the Rainbow Valley area is a potential source of Valley Fever spores (83). Soil disruption may pose a risk to the construction work force due to possible exposure to large numbers of spores. The relationship between extreme wind velocities and airborne soil containing the spores is an important consideration during construction of the facility. Although there are no data to indicate the extent to which spores may be dispersed by the wind in the general area, data from an outbreak in California suggest that airborne spores may travel several hundred miles during high-velocity wind conditions (84). Examination of the meteorological data from the Phoenix area indicates that outbreaks of the disease could develop following periods of gusty winds when the facility is under construction. Evidence suggests, however, that the spread of Valley Fever even under these conditions would be low, since immunity is presumed to have been built up over time in most area residents. This is because previous disturbance of soils in the area is likely to have exposed residents to the Valley Fever spore already.

Western Harquahala Plain and Ranegras Plain Sites--

There are no data on Valley Fever in the vicinity of the Western Harquahala Plain and Ranegras Plain sites. Since desert areas throughout much of Arizona may contain the Valley Fever spore, it is assumed that the impacts would be similar to those at the Mobile site. The population subject to potential exposure to the spores, however, would be lower than at the Mobile site.

Mitigative Measures--

There is no method for completely eradicating Valley Fever spores from the entire site. However, ADHS would work with the facility contractor to minimize the severity of its outbreak through such precautions as the following:

- Minimize the area of soil disruption activities occurring during facility and road construction.
- Sample soils for spores to identify areas of especially high spore density. Appropriate mitigation or avoidance would be taken in such areas.
- Confine soil-disturbing activities to periods of low wind velocity. This would reduce the potential for distributing airborne arthrospores.
- Landscape and periodically water the soil to reduce dust, or use chemical dust suppressants.
- Require the contractor to consult with experts on the best practical control measures.
- Monitor health records for the area for indications of Valley Fever problems.
- Where appropriate, use face mask respirators as reliable safeguards for occupationally exposed individuals.
- Disseminate information on exposure risks to the on-site construction workers, especially regarding the practice of carrying contaminated clothes to their residences.

Odors

Mobile Site--

Hazardous waste management facilities have the potential to generate chemical odors from the treatment, storage, and disposal of waste material, depending on the types of wastes handled and the methods of handling them. The transmission and movement of chemical odors are related to atmospheric conditions.

Information on off-site odors at similar facilities indicates that the concentrations have generally been low and not threatening to public health. Most odors are known to dissipate on site, but this may change depending on atmospheric conditions. Odors generated at some hazardous waste facilities located in or near urban areas have been sources of citizen complaints (78, 85).

The proposed site is located in a rural desert area with a low population density, and is characterized by natural background odors. Given the distance from the facility to the nearest residences (approximately 6 miles) odors are not expected to be a problem off-site. This would depend, however, on the frequency, amount, and type of spills, treatment techniques, wind conditions, and odor-reducing techniques used at the proposed facility.

Western Harquahala Plain and Ranegras Plain Sites--
The environmental impacts of odor at these two sites are similar to those described for the Mobile site.

Mitigative Measures--
Although odors are not expected to be a problem off-site, there are a number of measures that may be used to reduce odor impacts that might occur. ADHS would (a) establish a system to respond to citizen complaints should a problem arise, (b) work with the contractor to alleviate any problems that did occur, and (c) through its monitoring program, ensure prompt cleanup of spills, reducing the potential for odors. Technologies for covering stored wastes are available. The wastes could be tested to determine the chemicals' suitability for evaporation in view of odor generation. Oxidation techniques using ozone and chlorine have been successful in reducing odor emissions from from wastes.

Noise

Mobile Site--
Because it is a rural desert area, the background noise levels around the Mobile site are generally low. Noise generated by power equipment and trucks at the facility would be expected to be considerably above background levels, but the general (ambient) noise levels would not be expected to exceed OSHA standards for occupational noise exposure (see Table O-1, Appendix O). Noise levels above OSHA standards could be experienced within a few hundred feet if particular pieces of equipment if no mitigation measures were taken. Noise generated at the facility would not be expected to affect Mobile, the nearest community,

because[*] of the six-mile distance between the community and the site.

Truck traffic and, to a lesser extent, automobile traffic would be expected to have an impact on areas near the access routes. The specific impact would depend on the background noise level and distance from the road. As trucks passed by, residents within approximately 700 feet of the roads in rural areas could experience peak noise at levels ranging from about 65 to 85 decibels. Noise at these levels could cause annoyance (see Appendix O). Each occurrence, however, would last only a matter of seconds, and the number of such occurences would be low due to the low number of trucks expected at the facility (an average of one per hour during operating hours). Consequently, the impact would be minimal.

The Mobile School and the Maricopa School are located next to potential access roads into the Mobile site. Trucks passing by could cause peak noise levels ranging from 60 to 85 dBA outdoors. Noise at these levels could disrupt conversation in classrooms which face the road, depending on such factors as the number of windows in the room and whether the windows were open or closed.[†] Again, the impact would be expected to be minimal because of the low number of trucks and the short duration of each truck pass-by.

Western Harquahala Plain and Ranegras Plain Sites--

The impact of noise generated at the facility would be the same as at the Mobile site. Noise levels generated by power equipment in use at the facility could exceed OSHA noise standards in areas close to the particular machine, but the noise would not reach nearby residents or communities. No impacts would be expected from transportation at either of these sites, since access would be from I-10. Truck traffic on I-10 is already heavy compared to that expected to be generated by the facility, and the addition of facility traffic would not significantly increase existing noise levels. There are no permanent residences close enough to main access roads between I-10 and these sites to be impacted by truck traffic.

Mitigative Measures--

The facility operator would be responsible for meeting all OSHA noise requirements for the protection of employees at the facility. These requirements are enforced by OSHA.

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[*] See Appendix O for a discussion of attenuation of sound over distance.

[†] Closed windows would block out much of the noise, but not as effectively as solid walls.

To minimize the impacts on communities and schools along the access routes, ADHS would:

- Require the contractor to limit to daylight hours facility activities which may generate traffic.
- Establish a system and procedures for receiving and responding to public complaints about noise.
- If requested by local school officials, monitor noise impacts on schools along the access roads and work with school officials to provide appropriate mitigation of any adverse impacts identified.

POTENTIAL IMPACTS ON ECOLOGICAL RESOURCES

Assessment Approach

Assessment of the impact of the proposed facility on ecological resources involved the analysis of growth characteristics of the dominant vegetation, and the habitats and migration patterns of common wildlife in the area.

Mobile Site

Vegetation--

Construction of the facility and its access roads would entail the gradual removal of vegetation on 58 acres over the life of the project. Food, shelter, and nesting habitats may also be removed from this limited area of operation. Removal of vegetation would not result in significant impacts to the ecosystem, since the acreage comprises only 9 percent of the site.

Natural revegetation of such areas could take a number of years to approach the vegetative quality of undisturbed areas. The resprouting of many desert shrubs will occur only if they have been cut at the soil surface and no subterranean damage has been sustained. Most perennial species are, by necessity, very slow-growing and equally slow to reinvade areas that have been cleared of vegetation. Revegetation in areas with more moisture would likely occur more rapidly; however, species that reinvade an area are usually different from those originally removed. Once revegetation has been completed and secondary succession occurs, the disturbed area (with the exception of the permanent structures) would return to its approximate original productivity (G-6). Enhancement of vegetation may be expected along the access roads where drainage trenches would be constructed.

Wildlife--

Probably the most significant impact on wildlife, other than the actual construction of the facility, will be the intrusion of humans into an area where access had previously been limited. The direct impact of construction may include kills of some animals.

Desert bighorn sheep are known to live within several miles of the site. They are noted for their sensitivity to human intrusion. Their habitat, however, is far enough from the site that no impact is expected. The probability of adverse impacts on predatory species (e.g., coyotes, foxes, etc.) and such species as rabbits is low due to their wide distribution throughout the study area and their ability to elude human activity.

During construction, some dens and burrows of small and medium-sized mammals could be destroyed. Such disturbances would be expected to impact only a very small percentage of the total population of these mammals (e.g., kangaroo rats, ground squirrels, gophers, pocket mice, skunks, and rabbits). Impacts on most lizards and snakes would also be insignificant, as they are widely distributed (53).

The disturbance or destruction of gullies in the surrounding areas could cause mortalities of both reptiles and small mammals. More mobile species, such as birds and larger mammals (e.g., rabbits, coyotes, etc.) would be expected to disperse to adjacent areas during construction. As habitats became available following revegetation, smaller animals (i.e., rodents) and other species would be expected to reinvade from surrounding populations (14).

The 1-mile access road into the site from the existing road would not be expected to increase accessibility to the area. Consequently, the facility would not be expected to cause any increase in illegal hunting, wildlife harassment, or disturbance by off-road vehicles.

The operation of evaporation ponds at the facility might pose a threat to the avian population attracted to the ponds as a source of water. Over a period of time, the bioaccumulation of hazardous substances may increase the number of bird deaths due to poisoning, as well as affect their birthrate.

Operation of the landfill portion of the facility should not pose a threat to the avian population. Although a given site may present numerous attractions for birds (e.g., food, warmth, water, nesting habitat), the strongest attractant at a landfill is generally food. Birds attracted to this type of food are either scavengers (e.g., starlings, cowbirds, and crows) or birds that by nature eat refuse and carrion. However, none of the landfill cells at the proposed site will contain a possible source of food in the form of putrescible refuse (found in sanitary landfills).

Rodents may create passageways which can cause increased water percolation. However, unlike a municipal waste facility, the proposed hazardous waste site will not contain a food source for the surrounding animal population, and therefore will provide very little, if any, attraction for rodents.

Noise created at the facility may deter birds and animals from entering.

Western Harquahala Plain and Ranegras Plain Sites

The potential impacts on vegetation and wildlife at these two sites are generally the same as those described for the Mobile site.

Mitigative Measures

Vegetation--

ADHS would require the facility contractor to minimize the amount of vegetation disturbed during construction activities. Vegetation should be removed from only those areas that are designated for construction or disposal operations. Since many desert shrubs will resprout following clearing, provided their roots are not damaged, the contractor would be instructed to take care not to destroy the roots of shrubs located in those areas which need only temporary clearing for construction activities.

Maintenance and construction roads would be held to the minimum size necessary, in order to avoid increased access to vegetative communities. Revegetation of disturbed areas with "appropriate" native seed or mature plants would take place following construction activities. "Appropriate" seed is that which is similar to the existing vegetation of a given plant community. The Arizona Commission on Agriculture and Horticulture and the Arizona Game and Fish Department should be consulted during planning for revegetation.

To meet federal regulations requiring coordination between the RCRA permit and the Endangered Species Act (16 USC 1531), the contractor would be expected to confirm whether the project would affect federally protected species, although none are currently known to exist at the proposed sites. Certain state-protected species would be removed or relocated from construction pathways. This includes all cacti, ocotillos, and other species so designated by the Arizona Commission on Agriculture and Horticulture.

Wildlife--

Adverse impacts to wildlife would be reduced by minimizing the extent of disturbance, where possible, and implementing a revegetation program immediately upon completion of construction. Contractors and their employees would be informed of the Arizona Fish and Game regulations protecting wildlife.

Bird control--The Game and Fish Department would be consulted on appropriate control measures, should a bird control problem arise. Several methods of bird control have been successfully used including wire mesh screens and noise makers.

Rodent control--If animal burrowings were to become a problem, ADHS would consult with the appropriate state agencies to determine rodent control methods adequate for the type of features at the site. ADHS agrees to consult with the Game and Fish Department on appropriate control measures, should a problem arise. Options include the use of cover materials (soils) which are not amenable to burrowing, use of artificial barriers, and trapping.

POTENTIAL IMPACTS ON LAND USE

Assessment Approach

For this assessment, only the physical impacts on land use were determined. The functional, social, and economic aspects of various land use categories were considered in determining the significance of impacts on land use due to implementation of the proposed project. It was assumed that the entire 640 acre site would be removed from its current use as grazing land. Since the facility is expected to use only a portion of the total site (approximately 58 acres), it is possible that the remaining land could continue to be used for grazing. The impact, then, would be less.

Mobile Site

The primary impact on land use that is expected would be the removal or loss of 640 acres currently used for livestock grazing purposes within BLM Conley Grazing Allotment. Since this is only 0.7 percent of the total size of the Conley Grazing Allotment (91,560 federal acres), this impact is not considered significant. Some impact on the recreation resources of the area could also result. Off-road vehicle enthusiasts may not object to the inclusion of a hazardous waste management facility in the environment unless it physically restricts their movement. Land uses such as grazing may recur after the facility has been fully closed, depending on the conditions of the permit.

Western Harquahala Plain Site

No major impact would be anticipated from the removal or loss of 640 acres (or 0.5 percent) for livestock grazing purposes with the BLM K Lazy B Grazing Allotment (total size of K Lazy B Grazing Allotment is 128,466 federal acres).

Ranegras Plain Site

No significant impact would be anticipated from the removal of range improvements (Salvation Well with trough and storage, corral, windmill, and other related equipment), and the removal or loss of 640 acres for livestock grazing purposes from the Crowder-Weisser Grazing Allotment. This represents 0.2 percent of the total 312,895 acres in the allotment.

Mitigative Measures

Land use impacts could be mitigated by reimbursing the owner or permittee for range improvements.

POTENTIAL IMPACTS ON VISUAL RESOURCES

Assessment Approach

Visual impacts were considered in terms of duration, quantity, and quality. The duration of a visual change was considered to be the life of the proposed action. Assessment of the quantity of the visual change assumed the disturbance of the entire site. The quality of the visual environment was based on tentative classes derived from a synthesis of scenic quality, visual sensitivity, and distance zones (see Appendix J). For each of these classes, BLM has specified management objectives and the degree of modification allowed. Finally, "sensitivity" (a measure of the probable adverse effect that the visual resources would suffer) was defined as visual contrast. The major contrast at the proposed and alternative sites would be the addition of structures to the landscape.

Mobile Site

The site is located in a Class C (minimal) scenic quality area. Structures at this site would result in a strong contrast to the existing landscape. The anticipated high visibility of the structures from key observation points would result in potentially significant visual impacts for a small number of recreational users of the area.

Western Harquahala Plain Site

The facility is expected to be visible from Highway I-10. However, other visual disturbances are currently visible from I-10, including the CAP Canal, a pipeline pumping station, a microwave station, and the utility corridor that includes a 500-kV transmission line. The presence of these structures could lower the contrast resulting from the proposed facility's structure. Also, the existing topography (and the location of the CAP Canal) reduces the overall site visibility, and ultimately, the visual impact of the proposed action at this site. The visual impacts on users of Eagle Tail Mountains WSA 2-128 (located 2 miles southeast) would be similar.

Ranegras Plain Site

The proposed facility could be a major visual intrusion to users of Little Horn WSA 2-127 (located adjacent to the proposed site) and of the Kofa Game Range. It should be noted, however, that the 500-kV transmission line which passes along the southern edge of the site significantly impacts the visual experience already. A windmill pump and water tank at a cattle pond on the site (Section 9) also intrude upon the natural landscape of the area as do existing dirt roads. From some locations near the site, I-10 can be seen in the distance. These existing intrusions would lower the significance of the facility's contrast to the natural environment.

Mitigative Measures

ADHS would ensure that landform and vegetation disturbance would be minimized where possible. Protective dikes should appear natural (e.g., approximating natural grades), and native vegetation should be used to reduce visual contrast. Higher dikes may reduce visual impacts at the Mobile site, depending upon viewer location, by blocking structures from view.

ADHS would ensure that the contrast caused by facility structures was minimized to the extent practical. Structures should appear natural and earth tone in color. In addition, the height of structures should be limited, if possible.

POTENTIAL IMPACTS ON CULTURAL RESOURCES

Assessment Approach

Assessment of impacts on cultural resources entailed (a) determination of the probability of encountering archaeological, historical, or Native American resources, (b) identification of physical (direct or indirect) and visual impacts caused by the proposed action, and (c) determination of site sensitivity and/or susceptibility to these impacts.

Direct physical impacts are those associated with construction-related activities, whereas indirect impacts are related to increased access. Direct impact was considered to occur at less than 0.25 mile from the proposed action, indirect impact up to 1 mile from the proposed action. Site sensitivity was determined by considering legal status, historical significance, site integrity, public significance, and scientific significance.

Mobile Site

No recorded archaeological, historical, or Native American resources are on the site. Available evidence indicates the probability of encountering any such resources during construction operations of the facility is low. The facility would be expected to eliminate the gathering of subsistence plants (e.g., mesquite beans) by Native Americans on the site. Given the small area of affected land and the sparse amount of subsistence vegetation at the site, however, this impact would be expected to be insignificant. Noise from trucks hauling wastes could impact hikers on the Butterfield Stage Trail or other users of cultural or historic resources in the area.

Western Harquahala Plain Site

No archaeological, historical, or Native American cultural resources have been identified. If any were encountered within or adjacent to the site during construction or operation of the facility, they could be adversely impacted.

Ranegras Plain Site

The potential impacts on cultural resources at this site are the same as those discussed for the Western Harquahala Plain site.

Mitigative Measures

The facility contractor, as part of the permit process, must either identify any cultural resources that exist at the site or confirm non-existence of such resources. If any such resources are identified, appropriate mitigation measures would have to be taken.

POTENTIAL IMPACTS ON SOCIOECONOMICS

Assessment Approach

Analysis of the socioeconomic consequences focused on the economic and demographic effects of the proposed facility, the effects of the facility on local communities, fiscal effects of the project, and potential effects of the project on land values in the project vicinity. Impacts on the quality of life in the project area were also evaluated, using professional judgement.

Mobile Site

Economic/Demographic Effects--

It is not anticipated that construction or operation of a hazardous waste management facility would affect economic or demographic conditions in the communities of Mobile or Rainbow Valley. The construction work force would be relatively small, and the period of construction would not be long enough to justify relocation to the vicinity of the site. The operations work force would be even smaller, and it is likely that they, like the construction workers, would commute daily from the Phoenix metropolitan area. As a result, there would not likely be any increase in employment of area residents or any increase in the population in the area due to the project. Although the facility would be expected to impact the economy of Phoenix, the effect would be indiscernible, given the large size of the metropolitan area.

Community and Fiscal Effects--

Given the absence of economic or demographic effects in the immediate area, there would be very limited community effects.

The most significant of these are related to increased traffic, which are discussed under Public Health and Safety.

A significant effect of the facility would be the increased revenue flow to regional and local jurisdictions. The proposed facility would be located on state-owned land, but all improvements would be the property of the contractor selected to build and operate the facility. The improvements would probably be valued as commercial property and subject to property tax. Table 4-9 shows the projected revenue flow assuming 1981 mill levies, and assuming two different levels of assessed value. The $4 million figure is an estimate of improvements likely to occur immediately, while the $12 million figure represents an estimate of eventual development. Under these assumptions, it can be seen that over $100,000 of property tax revenue would flow to local jurisdiction at once with an eventual revenue flow of as much as $350,000. Approximately 75 percent of the revenue would flow to the Mobile Elementary School District No. 86.

Because the proposed hazardous waste management facility would be rendering a service rather than a tangible product, it would not be subject to sales tax (50). During the construction period, some sales tax revenue would be generated from the purchase of construction materials within the county. Materials purchased outside the county would generate use tax revenue.

Land Value Effects--

Because of conflicting effects on land values, it is not possible to project the impact of the facility on land values. Improved road access to the site plus increased economic activity in the area could cause land values to rise. On the other hand, if there are real or perceived public health or safety consequences of the facility, land values might be depressed. To date, land values at the site have risen from approximately $400 per acre in 1981 to approximately $500 per acre. This rise in value may be due to the location of the proposed Provident Energy Company refinery in the vicinity.

Quality of Life Effects--

In 1980, the Mobile site had an estimated population of 420 persons within a 15-mile radius. Many of these persons find the area attractive because of its rural desert nature and lack of industrial intrusion. Very few will view the facility going to or from their residence or work. Some residents, primarily those living in scattered residences south of the road between Maricopa and Mobile, may occasionally be annoyed by truck traffic associated with the facility. It should be noted that presently approximately 1 train/hour passes through the area. More generally, many area residents have expressed a concern about public health effects of the facility. Some will undoubtedly experience anxiety because of the facility. Thus, even though the total number of affected persons is small and the impacts on the population minor, some will perceive a deterioration in the conditions which originally made the area attractive to them.

TABLE 4-9. PROJECTED PROPERTY TAX REVENUE FROM THE MOBILE SITE

Jurisdiction	1981 Mill Levy	Tax Revenue Assuming $4 Million Fair Market Value; $1 Million Assessed Value	Tax Revenue Assuming $12 Million Fair Market Value; $3 Million Assessed Value
Maricopa County Flood Control District	0.34	$3,400	$10,200
Central Arizona Water Conservation District	0.03	300	900
County of Maricopa	1.78	17,800	53,400
Maricopa County Community College District	0.81	8,100	24,300
State of Arizona	0.95	9,500	28,500
Mobile Elementary School District No. 86	7.96	79,600	238,800
Total	11.87	$118,700	$356,100

Western Harquahala Plain Site

Economic/Demographic Effects--

Construction and operation of a hazardous waste management facility would not be expected to have economic or demographic effects on the local area in the immediate vicinity of the site. The discussion of this issue for the Mobile site is relevant to this conclusion. The work forces, both construction and operation, are small and would be expected to commute from Phoenix or from the Colorado River towns. Because of the distance of the Western Harquahala Plain site from Phoenix, some construction workers might choose to stay during the workweek in one of the small towns along I-10. Since these communities attract both tourists and seasonal visitors, local accommodations are plentiful, and no adverse effects would be expected. These communities may realize some economic benefits from having the construction work force stay in the vicinity.

Community and Fiscal Effects--

As with the Mobile site, the only significant community or fiscal effects are those associated with the flow of property tax revenues to local jurisdictions. Table 4-10 shows anticipated flows under the 1981 mill levy. As shown, these are very similar in magnitude to those estimated for the Mobile site. It should be emphasized that because of the recent creation of a new county within which the Harquahala site is located, the mill levies shown in Table 4-10 are only illustrative of what could actually be expected.

Land Value Effects--

The land value discussion for the Mobile site applies equally to the Western Harquahala Plain site.

Quality of Life Effects--

The quality of life effects for the Western Harquahala Plain site are similar to those for the Mobile site. In 1980, a total estimated population of 930 lived within a 15-mile radius of the site, most in Salome. Many area residents find the area attractive because of its rural, unspoiled character. Anxiety with respect to possible public health effects could be viewed as a source of deterioration in the quality of life for some people. Because the interstate bypasses existing communities, truck traffic to the facility should not be a problem.

Ranegras Plain Site

Economic/Demographic Effects--

The economic/demographic discussion for the Western Harquahala Plain site applies equally to the Ranegras Plain site.

Community and Fiscal Effects--

The community and fiscal effects for the Ranegras Plain site would be the same as for the Western Harquahala Plain site, except that 1981 mill levies are slightly different. Table 4-11

TABLE 4-10. PROJECTED PROPERTY TAX REVENUE FROM THE WESTERN HARQUAHALA PLAIN SITE

Jurisdiction	1981 Mill Levy	Tax Revenue Assuming $4 Million Fair Market Value; $3.4 Million Full Cash Value; $0.85 Million Assessed Value	Tax Revenue Assuming $12 Million Fair Market Value; $10.2 Million Full Cash Value; $2.55 Million Assessed Value
Vicksburg Elementary School District	2.72	$23,375	$69,360
Bicentennial High School District	3.59	30,515	91,545
Arizona Western Community College District	1.63	13,855	41,565
State of Arizona	0.95	8,075	24,225
County of Yuma*	2.19	18,615	55,845
Total	11.08	$94,435	$282,540

* These figures are given for illustration only. The site is in the newly created La Paz County (effective January 1, 1983).

TABLE 4-11. PROJECTED PROPERTY TAX REVENUE FROM THE RANEGRAS PLAIN SITE

Jurisdiction	1981 Mill Levy	Tax Revenue Assuming $4 Million Fair Market Value; $3.4 Million Full Cash Value; $0.85 Million Assessed Value	Tax Revenue Assuming $12 Million Fair Market Value; $10.2 Million Full Cash Value; $2.55 Million Assessed Value
Vicksburg Elementary School District	3.62	$30,770	$92,310
Bicentennial High School District	3.59	30,515	91,545
Arizona Western Community College District	1.63	13,855	41,565
State of Arizona	0.95	8,075	24,225
County of Yuma*	2.19	18,615	55,845
Total	11.98	$101,830	$305,490

* These figures are given for illustration only. The site is in the newly created La Paz County (effective January 1, 1983.

shows revenue flows that were generated under 1981 mill levies. As was discussed for the Western Harquahala Plain site, these levies are difficult to anticipate in light of the recent formation of the new county. Nevertheless, Table 4-11 is illustrative of the property tax revenue flows that the proposed hazardous waste management site could generate.

Land Value Effects--
The land value discussion for the Mobile site applies equally to the Ranegras Plain site.

Quality of Life Effects--
Except that the 1980 population estimated within a 15-mile radius of the site is only 535 (mostly in Salome), the quality of life discussion for the Western Harquahala Plain site applies equally to the Ranegras Plain site.

Mitigative Measures

Measures for mitigating socioeconomic impacts are identical to those described for mitigating land use and public health and safety impacts. ADHS would recommend that the contractor consider local residents for jobs at the facility, as appropriate.

CONSEQUENCES OF NO-ACTION ALTERNATIVE

Under this alternative, BLM would deny the state's request for transfer of the land. Because ADHS is mandated under law to purchase the BLM site, denial of the request by BLM would leave the state with two options: (a) cease efforts to develop a state-owned facility; or (b) continue efforts to site the facility on land other than the sites considered in this EIS. Both options would require guidance from the state Legislature and/or legislative amendments to ARS 36-2800.

Cease Facility Development Efforts

Under this option, the state would either remain without an off-site hazardous waste management facility or depend on private industry to develop a facility without state assistance.

No Off-Site Facility--
Without an off-site facility, Arizona waste generators would have three options: on-site treatment, storage, or disposal (TSD); out-of-state disposal; or illegal disposal.

On-Site Treatment, Storage, and Disposal--State and federal regulations now require facilities with on-site TSD operations to obtain a permit and meet stringent design and operating standards. The cost of meeting these requirements can be very high. Smaller generators are especially likely to find this option economically unfeasible. Because of this, many generators who currently treat, store, or dispose of their waste on-site may choose to discontinue or modify their operations so they do not need to obtain a hazardous waste permit. This appears to be the case with 13 Arizona firms which withdrew their EPA permit applications as of September 1982. This supports a general national trend toward increased need for off-site disposal capacities (85).

Out-of-State Disposal--The only legal option for those regulated generators unable to treat, store, or dispose of waste on-site would be out-of-state disposal. This is currently the practice of numerous Arizona generators.

The cost of transporting hazardous waste is high. ADHS judges that this is one of the reasons Arizona industry has backed efforts to site an in-state facility. A private company recently opened a transfer station in Phoenix which combines small waste loads into large, more economical shipments. This may lower the transport costs for Arizona generators to some extent. ADHS believes, however, the cost of hauling wastes long distances to out-of-state facilities will remain high and may encourage firms to use cheaper, environmentally unsound or illegal disposal methods. Also, there are no assurances that out-of-state facilities will always remain available to Arizona generators.

The risk of hazardous waste spills could be expected to increase if shipments to out-of-state facilities increased.

Illegal Disposal--Representatives of the City of Phoenix, Maricopa County Highway Department, Arizona Chamber of Commerce, Arizona Association of Industries, and Arizona Public Service and other industry leaders believe that there may be a significant increase in illegal disposal if no affordable legal options exist. Because the state will be conducting inspections of generators, many generators may want to remove the hazardous wastes from their places of business in the most expedient way. This may result in disposal of hazardous waste into sewers or other unauthorized places such as the desert or vacant lots.

Development of a Privately-Owned Facility--

If the state-supported effort to develop a facility ends, private firms may seek to develop a facility without state assistance. Privately owned land for the facility would be acquired, if not already held by the facility developers. Neither ADHS nor EPA knows of any such efforts at this time.

It is likely any private siting effort would meet strong public opposition from residents of any siting area. This has been the experience in a majority of siting efforts nation-wide, both public and private (87). This makes it difficult for a private firm to succeed in developing a new hazardous waste facility. Current Arizona law does not provide for the state to override a local decision against siting a private facility. Failure of private siting efforts under such circumstances in the State of Washington led the state to propose a state-wide facility for extremely hazardous wastes similar to the Arizona proposal (81). Additional discussion of the private facility option is contained in the State's Siting Report (1).

Attempt to Acquire Alternative Land for State Facility

If the state's request to purchase land from BLM is denied, the second option open to the state is to attempt to acquire an alternative parcel of land on which to construct a state-owned facility. Because ADHS has no authority from the Legislature to acquire any land other than that cited in SB 1033, purchase of an alternative site using state funds would require new legislation. In the absence of an offer by BLM to sell an alternative parcel in any of the three sites originally recommended by ADHS and considered in this EIS, the Legislature's options would be to reconsider other sites addressed in ADHS's study or select a site not previously studied in detail. An alternative site could be on federal, state, or private land.

The possibility of selecting any site other than one already recommended by ADHS has been addressed in the State's Siting Report (1). Any new effort to evaluate additional potential sites would cause considerable delay in development of a facility. In addition, an effort to site a facility on federal land not considered in this EIS would require preparation of another EIS. Such delays would have the same effect as stopping the site development process altogether until a new site could be selected and approved. That process could take an additional two to four years, or more, depending on the effort put into site review and on whether another EIS was required.

UNAVOIDABLE ADVERSE IMPACTS

This subsection identifies unavoidable adverse impacts that would result from implementation of the hazardous waste management facility at the proposed site and the two alternative sites. These unavoidable adverse impacts are summarized below.

Resource	Unavoidable Adverse Impacts
Topography/Soils	Fifty-eight acres of land would be permanently affected by the construction of the facility and access roads into the site from existing roads. Topography would be substantially altered and soils would be disturbed or removed. This would result in disturbance of site's natural vegetation, and, subsequently, in increased wind and water erosion.

Resources	Unavoidable Adverse Impacts
Water Resources	Ground water would be adversely affected only in the event of a major, undetected long-term facility leak. Existing drainage patterns for intermittent surface water flow could be permanently changed, to divert storm water run-on.
Air Quality	Air quality at the proposed site would be reduced during construction due to fugitive dust. Pollutant emissions (VOC) could be significant.
Public Health and Safety	Spill risks exist on site and along the transit routes. Soil disturbance may pose the risk of Valley Fever to construction workers. Impacts also include dust, noise, and traffic nuisances for communities near the facility and those along the transit routes during facility construction and operation.
Ecology	Vegetation would be removed from those areas that are designated for construction or for disposal operations following construction activities. The operation of evaporation ponds may pose a threat to birds.
Socioeconomics	Because of conflicting effects on land values, it is not possible to project the impact of the facility on land values. Odors, traffic noise, and anxiety with respect to other possible public health and safety effects could cause deterioration in the quality of life to a small number of people.
Land Use	Land occupied by the facility would no longer be available for certain future uses. Some uses, such as grazing, could occur after the facility has been fully closed, depending on the conditions of the permit.
Visual Resources	Impacts include visual disturbances caused by facility structures and a decrease in natural scenic quality.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The resources committed to this project would be similar at all three sites considered. The project would result in a commitment of a small area of land (approximately 58 acres) to disposed hazardous wastes. This commitment would be irreversible except by total removal of the wastes.

The material, personnel resources, and energy committed to construction and operation of the facility would be irretrievable. Given the size of the project, however, the amount of resources would be minimal. The state would commit resources for monitoring and inspection programs for the facility. These resources would represent a small portion (probably 3 to 4 percent) of the total budget for the state's hazardous waste management program. The state would also commit an undetermined amount of funds (contributed by the facility contractor to the State Trust Fund) for perpetual care of the facility after the 30-year postclosure period.

Energy consumption at the facility would be minimal. The greatest consumption of energy would be related to the transport of wastes to the facility. Over 8,300 gallons of fuel could be consumed monthly in transporting wastes to the Mobile site (based on the estimated number of round trips from Phoenix and Tucson, and assuming a truck fuel consumption rate of 5 miles per gallon). Nearly 10,000 gallons per month would be consumed in transporting wastes to either Western Harquahala Plain or the Ranegras Plain site. This could represent a net energy savings over transporting the same amount of waste to existing out-of-state facilties, because of the greater distances involved.

The greatest resource which could potentially be affected is ground water. The probability of ground water contamination is extremely low. If it did occur, the impact could be reversible through the implementation of corrective action. The cost of corrective action, however, would represent an irretrievable commitment of resources.

SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

This subsection describes the relationship between the short-term use of the environment and potential future long-term productivity. The short term has been defined as 30 years (the estimated life of the proposed project), and long term as the period thereafter. The relationship would be similar for all three sites, unless otherwise specified.

Physical Setting

Within the life of the proposed project, the construction phase would represent the period of greatest impact to the physical environment, involving disturbance of land for both the facility and access roads. The construction of the proposed facility would entail the greatest short-term impacts. Following the construction phase, some of this disturbed land would begin to revert to its preconstruction conditions. Short-term use of land for hazardous waste disposal would preclude some alternative productive uses of that land over the long-term. Only an estimated 58 acres would be affected, however.

Water Resources

Water resources should not be impacted by the proposed action provided that suitable hydraulic barriers are properly installed and maintained, and that the facility is operated in a manner that minimizes leachate production. If the ground water is adversely impacted, the effects could be long-term.

Air Quality

During construction, short-term minor impacts on air quality would result from fugitive dust emissions. Ultimately, the planting of suitable and hardy native vegetation would restore the soil surface and reduce fugitive dust emissions to near-natural levels. Long-term effects on air quality are considered to be insignificant.

Public Health and Safety

To the extent that the proposed hazardous waste facility helps to reduce the use of environmentally unsound or illegal disposal in Arizona, both public health and the environment would benefit over the long term. The uncontrolled release of hazardous constituents from the facility, however, could pose a potential long-term health hazard to nearby residents, though the risk of such a hazard is low.

Ecological Resources

Vegetation--

Short-term impacts are expected from the disturbance of vegetation over a portion of the site by construction activities. Species composition would change during the successive stages of natural revegetation, and it may take a number of years for the existing vegetation to become reestablished. Thus, due to the relatively slow recovery rate for disturbed desert vegetation, short-term impacts may remain for a long time. Long-term impacts can also be expected wherever vegetation is permanently destroyed, or has been disturbed and is prevented from returning to its natural condition.

Wildlife--

The proposed action would not prevent continued long-term use of the area by wildlife. Wildlife resources would be temporarily affected by construction activities and to a lesser extent by operations. After revegetation is completed and secondary succession occurs, the disturbed areas, with the exception of permanent structures, should return to approximately the original productivity and should support similar pre-existing populations.

Visual Resources

Short-term visual impacts would occur throughout the entire project area. Long-term visual impacts would depend on closure procedures.

Cultural Resources

Use of the Mobile site for disposal of hazardous waste could preclude the long-term use of a very small area of land for the gathering of traditional desert food plants by Native Americans.

Socioeconomics

Regional and local economies could be expected to experience short-term benefits from project-related expenditures. Regional and local tax revenue increases would provide short-term productivities. No short- or long-term dislocations of local infrastructures are anticipated because of the small numbers of workers that would be required over the construction period and for the life of the project.

Land Use

The site would be removed from grazing over the life of the project. Long-term use of portions of the site for grazing or other beneficial uses (e.g., recreation) could be limited because of the potential hazards to humans or animals, or potential damage to closed disposal units.

SECTION 5

LIST OF PREPARERS

This EIS for the proposed hazardous waste management facility was prepared by EPA Region 9 with technical assistance from SCS Engineers. Under subcontract to SCS were Aerocomp, Inc., for the Air Quality subsections, and Wirth Associates, Inc., for Socioeconomics, Land Use, Public Health and Safety, and Visual and Cultural Resources. BLM and ADHS also contributed to selected subsections of the EIS.

The following individuals participated in the preparation of the technical sections of the Draft EIS. Their education, project role, and experience are summarized below.

EPA - REGION 9

Charles Flippo, EIS Project Officer

M.P.A. - California State University, Hayward
Public Administration

A.B. - University of California, Berkeley
Political Science

Mr. Flippo coordinated the activities of the contractor and the lead and cooperating agencies, and managed EPA's contract with SCS Engineers. In addition, he prepared portions of the EIS dealing with federal regulations. He has five years' experience with EPA, most recently in liaison to the State of Arizona for the hazardous waste management program.

Fredric Hoffman, Hydrogeologist

M.S. University of Nevada, Reno
Geology

A.B. - Dartmouth College, New Hampshire
Geology

Mr. Hoffman is a member of the Technical Staff of the Office of Technical and Scientific Assistance, EPA Region 9. As regional hydrogeologist, Mr. Hoffman prepared the sections on estimates of ground water movement in the vicinity of the Mobile site, and participated in the preparation of all section concerning ground water.

Kent M. Kitchingman, Engineer

B.S. - Portland State University
Electrical Engineering

Mr. Kitchingman, a Regional Air Pollution Control Expert, works in Region 9's Office of Technical and Scientific Assistance. He reviewed air emissions estimates for this EIS and assisted in prepared in preparing air emissions calculations.

Vivian Thomson

A.B. - Princeton University

M.A. - University of California, Santa Barbara

Ms. Thomson is an environmental scientist in the Air Management Division of EPA. Her specialty is toxic air contaminants. She assisted in the writing and analysis of the air quality impacts and emissions.

SCS ENGINEERS

David E. Ross, Technical Advisor

M.S., University of California, Berkeley
Civil Engineering

B.S., University of California, Berkeley
Civil Engineering

Registered Professional Engineer, California and Virginia

Mr. Ross provided the project team with technical and administrative direction. Mr. Ross has participated in and managed over 150 projects related to solid and hazardous waste management, socioeconomic analysis, resource recovery, environmental impact assessment, and water pollution control.

Jasenka Vuceta, Project Director

Ph.D., California Institute of Technology
Environmental Engineering Science

M.S., California Institute of Technology
Environmental Engineering Science

B.S., University of Zagreb
Biotechnology Engineering

Dr. Vuceta was responsible for contractual matters and work quality, and coordination of all subcontractor activity. Dr. Vuceta's recent experience includes managing several hazardous waste projects for the space shuttle programs, including inventory, classification, and development of waste treatability and disposal alternatives.

Hang-Tan Phung, Project Manager

Ph.D., University of Florida
Soil Chemistry

M.S., Montana State University
Soil Science

B.S., National Taiwan University
Agricultural Chemistry

Certified Professional Soil Scientist

Dr. Phung managed and provided technical review to the project. Dr. Phung has managed numerous projects on land disposal of hazardous wastes covering siting, disposal procedures, regulatory compliance, and subsurface investigations.

Earl G. Hill, Senior Hydrogeologist

B.S., University of Maine, Orono
Geology

Certified Geologist, California and Maine

Mr. Hill coordinated the physical setting portion of this project. Mr. Hill has been responsible for siting, geological and hydrogeological investigations, remedial action alternatives, and preparation of closure and post-closure plans for many hazardous waste disposal facilities.

Lam Van Ho, Senior Project Scientist

Ph.D., University of Florida
Soil Science

B.S., National Agricultural Institute (Viet Nam)
Agriculture

Certified Professional Soil Scientist and Agronomist

Dr. Ho prepared the conceptual designs for various disposal alternatives, and assessed the no-action alternative of this project. Dr. Ho has provided technical assistance to numerous projects pertaining to solid waste management, economic analysis, conceptual design, and environmental impact assessment.

J. Rodney Marsh, Senior Project Engineer

M.S., Illinois Institute of Technology
Environmental Engineering

B.S., California State University, Long Beach
Chemistry

Mr. Marsh assisted in the analysis of current hazardous waste generation in Arizona, and in the development of disposal methods for the prospective waste streams. His recent experience includes hazardous waste inventory, characterization, and treatability, data management, and literature search.

Barbara A. Fontes, Associate Staff Scientist

M.S., California State University, Dominguez Hills
Geology (in progress)

B.S., California State University, Dominguez Hills
Environmental Geography

Ms. Fontes gathered background information on the physical setting and water resources for the project. Her experience includes mapping of aquifers, as well as preparing ground water maps for Indian lands in Arizona, California, and Nevada.

AEROCOMP, INC.

Joseph A. Catalano, Project Manager

M.S., University of Missouri
Meteorology and Computer Science

B.S., University of Illinois
Physics and Mathematics

Mr. Catalano provided overall project coordination and technical review to the Aerocomp team. His experience includes management of Aerocomp's air quality projects for the past 7 years.

Thomas P. Chico, Research Meteorologist

M.S., University of Arizona
Atmospheric Science

B.S., New York University, Bronx
Meteorology

Mr. Chico computed emission rates and prepared the air quality portion of this project. His experience includes model development and air pollution meteorology.

Frank V. Hale III, Research Programmer

B.S., University of California, Irvine
Information and Computer Science

Mr. Hale was responsible for developing emission and dispersion modeling. He has 3 years of experience in developing and use of emission inventory and dispersion models.

WIRTH ASSOCIATES, INC.

Garlyn Bergdale, Project Manager

M.S., Utah State University
Landscape Architecture

B.S., Winona State University
Geography

Mr. Bergdale coordinated the land use, public health and safety, socioeconomics, and cultural resources studies, and conducted the visual resources assessment for this project. Mr. Bergdale has extensive experience in managing and documenting studies to comply with NEPA regulations and guidelines.

James Cleland, Manager for Cultural Resources

Ph.D., University of Virginia
Anthropology

M.S., University of Virginia
Anthropology

B.S., University of Michigan
Anthropology

Dr. Cleland was responsible for the technical review of the archaeology, history, and ethnology of all cultural resources. Dr. Cleland has conducted and managed the cultural resource studies for transmission line sitings and assessments, urban redevelopment projects, housing projects, master plans, hydroelectric facilities, and pipelines in Arizona, California, and Colorado.

Clyde Woods, Cultural Anthropologist

Ph.D., Stanford University
Anthropology

M.A., Stanford University
Anthropology

M.S., California State University, San Jose
Sociology

B.A., California State University, San Jose
Social Science

Dr. Woods conducted the study of Native American cultural resources (ethnology) for this project. Dr. Woods has performed numerous ethnological studies for inclusion in environmental documents in accordance with federal legislation, including NEPA and the American Indians Religious Freedom Act.

Cindy Smith, Researcher

Arizona State University
Graduate Studies (in progress)

B.A., California State University, Chico
Liberal Arts

Ms. Smith conducted the archaeological and historical research for this study. Ms. Smith has performed similar research for major cultural resource studies to comply with NEPA regulations and requirements.

Mark Schaffer, Land Use Analyst

M.S., Arizona State University
Recreation (in progress)

B.S., Arizona State University
Geography

Mr. Shaffer conducted the land use study for the project. He has previously assisted and coordinated in documenting numerous land ownership and land use inventories and assessments.

David Pijawka, Assistant Director, Center for Environmental Studies, Arizona State University

Ph.D., Clark University
Environmental Geography

M.A., Clark University
Geography and Environmental Management

B.A., Brock University, Canada
Geography

Dr. Pijawka directed the Public Health and Safety section of the study. He was primarily responsible for the assessments of transportation spill risks, coccidioidomycosis, noise, odors, and other public health impacts. He has specialized in the area of environmental risk assessment, and has published widely in this field.

Joann E. Nigg, Assistant Professor, Arizona State University

Ph.D., University of California, Los Angeles
Sociology

B.A., University of California, Los Angeles
Sociology

Dr. Nigg researched and assessed the capacity of public safety and emergency management agencies to respond to chemical spills and site emergencies. Her experience includes social and organizational response to natural and technological hazards with emphasis on hazard mitigation policy development.

Pamela Stutts, Analyst

M.S., Arizona State University
Public Administration

B.A., Sonoma State University
History

Ms. Stutts assisted in the socioeconomic research for this study. She has worked on the Governor's Commission on Tax Reform and School Finance where she was responsible for research on local fiscal relations. For the Arizona Division of Emergency Services, she coordinated work related to the relocation of three communities in the Gila River floodplain.

James A. Chalmers, Project Director

Ph.D., University of Michigan
Economics

B.A., University of Wyoming
Economics

Dr. Chalmers was responsible for socioeconomic research for this study. Dr. Chalmers is credited with developing much of the economic and demographic methodology currently used throughout the western United States to assess siting and construction impacts from development of new industrial activities. His experience includes aesthetic evaluation of impacts on visibility and visual resources, social impact assessment, and assessment of the effects of potential hazards on land value and land use.

ARIZONA DEPARTMENT OF HEALTH SERVICES

Tibaldo Canez, Site Manager

B.S. - University of Arizona
Chemistry

Mr. Canez is responsible for managing development of the hazardous waste facility and for ADHS's hazardous waste data system. He prepared portions of the EIS dealing with the state's hazardous waste management program and the facility development process. He also coordinated the work of the other ADHS staff members who contributed to the EIS.

REVIEWERS AND CONTRIBUTORS

EPA

- Carole Beigler, Water Management Division.
- Mark Flachsbart, Water Management Division.
- Matthew Haber, Air Management Division.
- Rick Hoffman, Office of Policy, Technical, and Resources Management.
- Fred Krieger, Toxics and Waste Management Division.
- Tom Rarick, Air Management Division.
- Don Thomas, Air Management Division.

ADHS, Bureau of Waste Control

- James Lemmon.
- Sally Mapes.
- Alan Roesler.
- Norman Weiss.
- William Williams.

Department of the Interior

- Patricia Port, Office of the Secretary, San Francisco.
- Frank Splendoria, Bureau of Land Management, Phoenix District Office.

SECTION 6

COORDINATION LIST

This EIS has been sent to the following agencies and organizations for review.

FEDERAL AGENCIES

- Advisory Council on Historic Preservation
- Department of Agriculture
    - Soil Conservation Service
- Department of Defense
    - Corps of Engineers
    - U. S. Air Force
- Department of Health and Human Services
    - Indian Health Service
- Department of the Interior
    - Bureau of Indian Affairs
    - Bureau of Land Management
    - Bureau of Reclamation
    - Geological Survey
    - National Park Service
- Department of Transportation
    - Federal Highways Office

STATE AGENCIES

- Arizona Agriculture and Horticulture Commission
- Arizona Department of Health Services
    - Bureau of Air Quality
    - Bureau of Water Quality
    - Bureau of Waste Control
    - Local Health Services
- Arizona Department of Public Safety
- Arizona Department of Transportation
- Arizona Department of Water Resources
- Arizona Division of Emergency Services
- Arizona Game and Fish Department
- Arizona Natural Heritage Program
- Arizona Office of Economic Planning and Development

Arizona Outdoor Recreation Coordination Commission
Arizona State Clearinghouse
Arizona State Historic Preservation Officer
Arizona State Land Department
Attorney General's Office
Governor's Commission on the Arizona Environment

LOCAL AGENCIES

Central Arizona Association of Governments
District IV Council of Governments
Maricopa Association of Governments
Maricopa County Board of Supervisors
Maricopa County Civil Defense
Maricopa County Development Agency
Maricopa County Health Department
Maricopa County Highway Department
Maricopa County Landfill Department
Maricopa County Manager
Maricopa County Planning and Zoning Department
Northern Arizona Council of Governments
Phoenix District Sanitation Department
Pinal County Administrator
Pinal County Board of Supervisors
Pinal County Highway Department
Pinal County Planning and Zoning Department
Southeastern Arizona Council of Governments
Tucson City Attorney's Office
Yuma County Board of Supervisors
Yuma County Health Department
Yuma County Highway Department
Yuma County Planning and Zoning Department

INDIAN TRIBES

Ak Chin Tribal Council
Colorado River Indian Tribe
Gila River Indian Community
Inter-tribal Council
Papago Tribal Council

OTHER ORGANIZATIONS

Arizona Association of Industries
Arizona Cattle Growers Association

Arizona Cotton Growers Association
Arizona Environmental Alliance
Arizona Farm Bureau
Arizona Mining Association
Arizona Parks and Recreation Association
Arizona Wildlife Federation
Arizona 4-Wheel Drive Association
Audubon Society
Environmental Council of Arizona
Izaac Walton League
League of Women Voters
Maricopa County Farm Bureau
Phoenix Metropolitan Chamber of Commerce
Salt River Project
Sierra Club
Southern Arizona Environmental Council
Tucson Environmental Council
Tucson Metropolitan Chamber of Commerce
University of Arizona, Council for Environmental Studies
Wildlife Society
Yuma County Farm Bureau

SECTION 7

REFERENCES

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Appendices

APPENDIX A

FEDERAL HAZARDOUS WASTE MANAGEMENT PROGRAM

In response to growing concern over solid and hazardous waste problems, Congress passed the Resource Conservation and Recovery Act (RCRA) in 1976. RCRA directed EPA to define and identify hazardous wastes, establish a manifest system to track waste shipments to ensure that they arrive at their intended destination, and set standards for facilities which treat, store, or dispose of hazardous wastes. The law requires that each person who owns or operates a hazardous waste treatment, storage, or disposal facility obtain a permit for the facility.*

As directed by Congress, EPA has developed regulations governing the handling of a hazardous waste from the time it is created as an industrial by-product to the time it is finally disposed of or rendered nonhazardous. The following is a brief overview of EPA's facility standards and the permit process. The full text of the final regulations is found in the Code of Federal Regulations (CFR) and in the Federal Register.†

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* Some firms which produce small amounts of hazardous waste are exempt from these regulations if they comply with certain general requirements. For most wastes, the exemption level is 1,000 kg/month. For wastes which are acutely toxic, the exemption level is much lower.

† When a federal agency issues a regulation, it first appears in the Federal Register, which is published daily by the U.S. Government Printing Office. Final regulations are incorporated into the CFR, which contains all federal regulations. The CFR is divided into Titles; Title 40 contains environmental protection regulations. Each Title is further divided into Parts designating specific regulations. In citing the regulations governing hazardous waste generators, for example, 40 CFR 262 refers to Title 40, Part 262, of the Code of Federal Regulations. The CFR and current issues of the Federal Register may be found in the documents sections of most major public or university libraries, or may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C.

TSD FACILITY STANDARDS

The purpose of EPA's Standards for Treatment, Storage, and Disposal (TSD) facilities is to:

- Prevent the unintentional release of hazardous constituents from a TSD facility.
- Detect any releases that do occur as early as possible, and contain them before they pose a hazard to human health or the environment.
- Ensure that corrective actions necessary to protect human health and the environment are taken if contamination occurs.

The TSD facility standards apply to all new TSD facilities and to existing facilities which have received a permit. An "existing facility" is one which was in existence when EPA's RCRA regulations took effect (November, 1980). An existing facility may continue to operate without a permit until EPA or the state is able to process their permit if the facility meets standards set in 40 CFR 265.

The TSD facility regulations include design and operation standards, ground water protection requirements, closure/post-closure requirements, financial responsibility and liability requirements, and provisions for contingency plans and emergency response procedures.

Design and Operation Standards

General Requirements (40 CFR 264.10 to 264.18)--

Facility permittees must inspect wastes received from off-site generators to be sure they have received those wastes described on the shipping manifest required under 40 CFR 262. They must have an analysis of the wastes which contains all of the information needed to treat, store, or dispose of the waste properly. Facility personnel must be trained in proper handling of hazardous wastes and in emergency procedures.

Permittees must make inspections often enough to detect malfunctions and deterioration in the facility structures or equipment, operator error, and discharges in time to correct them before they pose a hazard. In addition, regular daily or weekly inspections are specified for each type of TSD facility to ensure that particular operational requirements for that type of facility are being met, and that the integrity of protective design features is being maintained. A log or summary of inspections must be kept. Any problem that is detected must be remedied before it poses a hazard to human health or the environment.

Facilities must be secured to prevent unauthorized entry to the facility, and warning signs must be posted. Precautions must be taken to prevent the accidental ignition or reaction of ignitable or reactive wastes.*

There are two standards regarding the location of a TSD facility. The facility may not be located within 200 feet of an active seismic fault. If a facility is located within a 100-year floodplain, it must be designed and operated to prevent the washout of any hazardous wastes by a 100-year flood (unless the waste can be moved to a safe location before the floodwaters reach them).

Certain recordkeeping is also required (40 CFR 264.73). A facility operating record must be kept, and must include:

- A description of each hazardous waste received, the quantity received, and the methods and dates of its treatment, storage, or disposal.
- The location of each hazardous waste within the facility, and the quantity at each location.

Standards for Specific TSD Facilities--

Containers (40 CFR 264.170 to 264.178)--Containers used for storing hazardous wastes must be in good condition, and must remain closed except to add or remove wastes. Storage areas must have a containment system capable of collecting and holding spills, leaks, and precipitation. The containment system must prevent, or be able to contain stormwaters which may run on to the area.

Tanks (40 CFR 264.190 to 264.199)--Tanks used to store or treat wastes must have sufficient shell strength and pressure control to ensure that they do not collapse or rupture. There must be controls to prevent overfilling the tanks so that no spillage occurs due to wave action or rainfall.

Land Facilities (40 CFR 264.220 to 264.316)--Treatment, storage, or disposal of wastes on land may involve the use of landfills (burial cells), surface impoundments (pits, ponds, or lagoons), waste piles, and land treatment units (landfarming).

The regulations include requirements to prevent the flow of rainwater or other liquids into a facility ("run-on") or off of a facility ("run-off"). These include run-on and run-off control and collection systems, prevention of overtopping of impoundments, and maintenance of the integrity of the design features such as containment dikes. Control of dispersal of wastes by wind is also required.

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* A reactive waste is one which may violently react or explode when mixed with water, or is otherwise capable of detonating or exploding (40 CFR 261.23).

A major concern with facilities in which wastes are placed on or in the ground is leachate control. When a liquid solution enters the ground in an amount which exceeds the capacity of the soil to absorb it, the solution percolates down through the ground. Such a solution is called leachate. Rainfall, for example, may form a hazardous leachate if it passes through a waste disposal unit and combines with water-soluble waste constituents. If leachate occurs in sufficient quantity beneath a hazardous waste facility, the hazardous solution could reach and contaminate an aquifer. Control of leachate from TSD facilities, then, is a key element of the hazardous waste management program.

To control leachate from new land treatment (landfarming) units, EPA's design and operating standards for these units require that hazardous constituents be degraded, transformed, or immobilized within the treatment zone. This must be demonstrated for each waste before it is applied to the land. The owner or operator must also monitor for migration of hazardous constituents out of the treatment zone.

For landfills, piles, and surface impoundments, the design and operating standards implement a liquids management strategy that has two goals: (a) minimize leachate generation at the facility; and (b) remove leachate generated to minimize its chance of entering the subsurface environment. The key requirements are:

- New landfills, piles, and surface impoundments must have a liner that is designed and installed to prevent any migration of leachate out of the facility throughout the active life of the facility.

- To minimize the amount of leachate present, new landfills and piles must have leachate collection and removal systems, as well as measures to prevent run-on of storm waters into the facility, and wastes contained by surface impoundments must be either removed or solidified when the facility or unit is closed.

- To provide for the long-term minimization of leachate generation, any facility from which hazardous constituents are not entirely removed at closure must be covered to minimize rainfall infiltration into the facility. The cover must be maintained for 30 years after closure.

A variance to the liner and leachate collection requirements is available to any facility demonstrating that alternate design and operating practices, together with location characteristics, will prevent leachate from ever migrating into the ground water or surface water.

Other precautions must be taken to avoid or remedy leachate problems. For example, no liquids (or materials containing liquids) may be placed into waste piles, and control of wind dispersal of waste in piles must be accomplished by means other than wetting.

Part 264.314 of the regulations also places restrictions on placement of liquid wastes or wastes containing free liquids into landfills. Containers holding free liquids may not be placed in landfills. Liquids which are not in containers (bulk liquids) may not be put into a new landfill unless the landfill is designed to prevent any wastes from seeping out into the adjacent soil. Alternatively, bulk liquid wastes may be treated or stabilized so that they are no longer free liquids. Landfill owners/operators are also required to maintain records showing the exact location of each burial cell and the contents of each cell, including the approximate location of each hazardous waste type within the cell.

Incinerators (40 CFR 264.340 to 264.351)--Incineration is a method of thermally treating hazardous wastes to reduce the volume of waste or transform it into chemically different substances which can be safely released into the atmosphere. EPA's regulations require that incinerators destroy 99.99 percent of the Primary Hazardous Constituents (PHC's) of the waste. Any hazardous residue left after waste has been incinerated must be properly disposed of.

Ground Water Protection Standards (40 CFR 264.90 to 264.100)

The design and operation standards for land units described above are intended to ensure that permittees minimize the formation of leachate and its migration to subsurface soils and ground water and to surface waters. A complementary set of ground water monitoring and response requirements is intended to ensure that permittees detect any ground water contamination that may occur, and take necessary corrective actions. The ground water protection requirements establish a three-stage program to detect, evaluate, and correct ground water contamination. The program must be complied with throughout the active life of the facility and 30 years after the facility is closed.

The first stage of the ground monitoring and response program is a detection monitoring program, which requires the permittee to install a ground water monitoring system (including both upgradient and downgradient wells) at the boundary of the waste management area. The permittee must monitor the ground water in the upper-most aquifer to determine whether leachate has reached the waste boundary. If leachate is detected, a second stage, the compliance monitoring program, is established. The compliance monitoring program monitors the concentration of specific hazardous constituents that are reasonably expected to be in waste disposed of at the facility, and that are found in the ground water.

The results of compliance monitoring are compared against a ground water protection standard. The standard requires that hazardous constituents not exceed the following concentration limits:

- The background level in the ground water.
- The maximum concentration limit for any of the 14 hazardous constituents covered by EPA standards set for drinking water* (unless the background levels are higher).
- Higher concentration limits which the permittee successfully demonstrates to be fully protective of human health and the environment. The permit would specify which concentration limits apply to the facility.

If the standard is violated, the third stage, corrective action, is activated. Corrective action must continue until the standard is met, even if it extends beyond the 30-year post-closure period. Corrective action could mean treatment of the contaminated water to restore its quality.

The regulations provide an option whereby owners or operators may comply with a more stringent set of design and operating standards, and thereby obtain a waiver of ground water monitoring and response requirements. These special standards include two bottom liners (instead of the single liner generally required), and a leak detection system between the liners (in addition to the leachate collection and removal system generally required for landfills and piles). If a leak is discovered, the leaking liner must be repaired or replaced, or else the owner or operator then becomes subject to the ground water monitoring and response requirements. (Exemption from the ground water monitoring and response requirements is also provided for piles that are inside buildings or are periodically removed from their liners so that the liners may be inspected for leaks).

Closure/Post-Closure Requirements (40 CFR 264.110 to 264.120)

When the useful life of a TSD unit is over, it must be properly closed to minimize the chance that any hazardous constituents of the waste will be released to the environment. Upon closing, all treated and stored wastes must be removed and properly disposed of. Disposal units, such as burial cells, must be properly capped to prevent the intrusion of rainwater which may cause leachate. All equipment which has been contaminated must be properly disposed of. Each facility must have a plan showing how it will be closed.

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* For list of these 14 hazardous constituents, see the Federal Register, July 26, 1982, page 32351.

A closed facility must be properly maintained for 30 years after closure to ensure the integrity of the caps and other protective measures. Monitoring wells to detect any contamination of ground water must also be maintained during this post-closure period. The permittee must prepare a plan to carry out post-closure monitoring and maintenance. Both the closure and the post-closure plans must be approved by EPA, since they become a condition of the facility permit.

Financial and Liability Requirements (40 CFR 264.140 to 264.151)

A facility permittee must establish a financial mechanism, such as a trust fund, to ensure that sufficient funds are available to implement the closure plan, and to provide for post-closure maintenance and monitoring. The costs of carrying out these plans must be revised annually, as necessary, to keep the cost estimates accurate and to ensure that adequate funds are set aside.

A permittee must also carry liability insurance to cover the risk of damage to persons or property due to accidental occurrences involving the facility. For sudden accidental occurrences, such as a spill or fire, the liability insurance must be in the amount of $1 million per occurrence, or an annual aggregate of $2 million. For non-sudden accidental occurrences, such as the slow leaching of contaminants over many years, the insurance coverage must be $3 million per occurrence, or an annual aggregate of $6 million.

Preparedness, Contingency Plans, and Emergency Procedures (40 CFR 264.30 to 264.56)

Facilities are to be designed, constructed, and operated so as to minimize the possibility of fires, explosions, or unplanned releases of hazardous constituents. The permittee, however, must have certain equipment and take certain precautions to ensure that facility personnel and local authorities can effectively handle any emergency which may arise. Required equipment includes a device for summoning local authorities and emergency response teams (such as a telephone or two-way radio), and fire-fighting equipment.

The permittee must have a contingency plan designed to minimize hazards from fires, explosions, or unplanned releases of hazardous wastes or their constituents to the air, soil, or water. This plan must be carried out immediately whenever there is a fire, explosion, or unplanned release which could threaten human health or the environment.

The contingency plan must describe actions the facility personnel will take to respond to an emergency. It must also describe arrangements made with local police and fire departments, hospitals, contractors, and state or local emergency services.

The plan must include an up-to-date list of all emergency equipment at the facility and an evacuation plan for personnel. The plan and all revisions to it must be submitted to local authorities.

At all times, the facility must have at least one employee either on the premises or on call who is responsible for coordinating emergency response measures. The emergency coordinator (or the on-site designee) must immediately implement emergency response procedures whenever there is an imminent or actual emergency.

The permittee must notify EPA whenever there is an incident covered by the contingency plan.

FACILITY PERMITS

Any facility which treats, stores (for more than 90 days), or disposes of hazardous waste must obtain a permit. A new TSD facility must obtain a permit before construction and operation can begin. In applying for the permit, the applicant describes how the facility will meet the requirements set forth in the regulations governing TSD facilities (see preceding section). The permit establishes the conditions and requirements imposed by the agency on the facility. Figure A-1 outlines EPA's permitting process under RCRA. The permit regulations are contained in 40 CFR 122 and 124.

Applying for a Permit

At least 180 days before physical construction of a new TSD facility begins, the owner or operator must submit a permit application to EPA. Construction of the facility cannot begin until the final permit has been issued.

The permit application consists of two parts:

(a) Part A forms, on which the applicant describes the processes to be used for treating, storing, or disposing of wastes, and the design capacity of these processes. The applicant also specifies the types and estimates the annual quantities of wastes to be treated, stored, or disposed of.

(b) Part B, which is a narrative description of how the facility will meet the standards which govern TSD facilities.

The application must include:

- A description of various procedures to be followed at the facility.

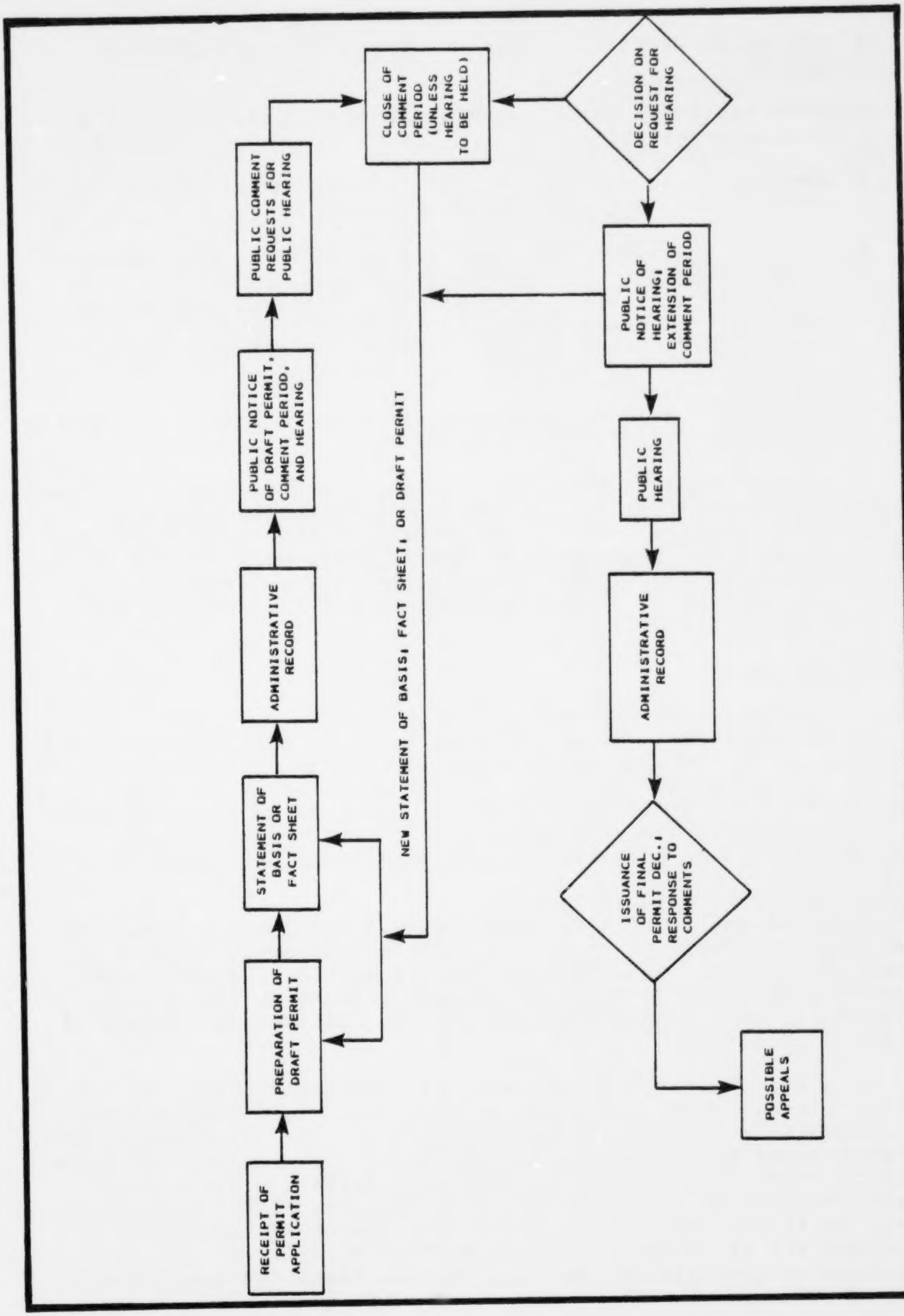
RECEIPT OF PERMIT APPLICATION
PREPARATION OF DRAFT PERMIT
STATEMENT OF BASIS OR FACT SHEET
ADMINISTRATIVE RECORD
PUBLIC NOTICE OF DRAFT PERMIT, COMMENT PERIOD, AND HEARING
PUBLIC COMMENT REQUESTS FOR PUBLIC HEARING
CLOSE OF COMMENT PERIOD (UNLESS HEARING TO BE HELD)
NEW STATEMENT OF BASIS, FACT SHEET, OR DRAFT PERMIT
DECISION ON REQUEST FOR HEARING
PUBLIC NOTICE OF HEARING; EXTENSION OF COMMENT PERIOD
PUBLIC HEARING
ADMINISTRATIVE RECORD
ISSUANCE OF FINAL PERMIT DEC.; RESPONSE TO COMMENTS
POSSIBLE APPEALS

Figure A-1. RCRA permitting process.

- Copies of the contingency, closure, and post-closure plans.

- Cost estimates for closure and post-closure monitoring and maintenance.

- Certain technical data, such as design drawings and specifications, and engineering studies.

- Topographic map showing surface water flow, the 100-year floodplain area, surrounding land uses, prevailing wind speed and direction, access control (fences and gates), wells both on- and off-site, location of buildings, roads, loading and unloading areas, operational units, and barriers for drainage and flood control.

A full listing of the information required in Part B of the permit application is given in 40 CFR 122.25.

Facilities located within a 100-year floodplain must provide an engineering analysis of the forces which are expected to result from a 100-year flood. Structural or other engineering studies showing how the design of the facility will prevent washouts must also be submitted. Alternatively, the applicant may describe procedures to remove hazardous waste to safety before the facility is flooded.

Issuing a Permit

Step 1. Completeness Review--

After receiving a permit application, EPA must determine the completeness of the application, usually within 30 days of its receipt for a new TSD facility. If the application is incomplete, EPA will request the additional information required from the applicant. If the applicant fails or refuses to correct deficiencies in the application, the permit may be denied.

Step 2. Draft Permit--

Once the application is complete, EPA will make a tentative determination either to prepare a draft permit or to issue a notice of intent to deny the applicant a permit. If EPA later reverses a decision to deny the permit, a draft permit will be prepared, and the same procedures will be followed for review of the draft permit.

If a draft permit is prepared, it will contain all the conditions placed on the applicant to meet regulatory requirements, all schedules for achieving compliance with the requirements, and all monitoring requirements. For each draft permit prepared for a major hazardous waste facility, EPA will prepare a fact sheet briefly describing the principal facts and the significant factual, legal, methodological, and policy questions considered in preparing the draft permit. This fact sheet will include a description of the type of facility and the types and quantities of wastes to be treated, stored, or disposed of; a summary of the basis for the draft permit conditions; reasons why any requested variances or alternatives to the required standards do or do not appear to be justified; a description of the procedures for reaching a final decision on the draft permit; and the name and phone number of a person to contact for additional information. The fact sheet will be mailed to all persons on the permit mailing list (including citizens who have asked to be on the list).

Step 3. Final Decision--

After the public comment period, EPA will issue a final decision to issue or deny the permit, and will respond to comments. If a permit is issued, it will normally take effect 30 days after notice of EPA's decision is given. EPA's regulations provide an avenue for appealing a permit decision to the EPA Administrator (see 40 CFR 124.19). A petition for the Administrator to review any condition of the permit decision must be filed within 30 days after the decision has been issued. The Administrator may deny the petition to review or accept the petition and institute the review. The Administrator's decision is final. Any further review of EPA's permit decision must come through court action (see Figure A-1).

If the permit conditions change, the permit must be modified using the same procedures, unless the modification is a minor one as defined in 40 CFR 122.17. Consequently, any time a facility owner or operator wishes to change the facility in a way that would affect the conditions of the permit (e.g., by adding new treatment processes, or by expanding the facility's capacity beyond that provided for in the original permit), the affected portions of the original permit must be changed. The proposed permit modifications will be subject to the same process, including public review, as the original permit (40 CFR 122.15).

The Role of the Public in the Permit Process

EPA issues a public notice whenever a permit application has been tentatively denied, a draft permit has been prepared, a hearing has been scheduled, or an appeal for an Administrator's review has been granted. The notice is sent to a mailing list which includes anyone who has asked, in writing, to be on the list. In addition, newspaper notices or other methods may be used to publicize the notice to persons potentially affected by the decision.

Any interested person may submit written comments on the draft permit during the public comment period, or submit oral or written statements or data at a public hearing. EPA may decide to hold a public hearing if there is a significant degree of public interest in the draft permit. If EPA has not scheduled a hearing, an interested person may request in writing that a public hearing be held by stating the nature of the issues proposed to be raised.

All comments will be considered in making the final decision. A response to each comment will be issued when the final permit decision is issued.

The Permit and Federal EIS Requirements

The National Environmental Policy Act (NEPA) establishes a national policy of encouraging productive harmony between man and the environment. One requirement of NEPA is that federal agencies must prepare an environmental impact statement on any major action that may significantly affect the quality of the human environment.

A federal decision which results in the development of a major hazardous waste facility is considered an action significantly affecting the environment, and NEPA's EIS requirements apply. EPA's decision on a permit, however, does not require an EIS. This is because courts have generally ruled that an EPA permit is the "functional equivalent" of an EIS, and is therefore exempt from NEPA's EIS requirements. These decisions have been based on the fact that an EPA permit involves extensive procedures, including public participation, for evaluating environmental issues. Also, EPA is an agency with recognized environmental expertise. Therefore, an EIS will not normally be prepared for a hazardous waste facility permit issued by EPA. (Federal Register, May 19, 1980, Page 33173.)

TRANSPORTATION OF HAZARDOUS WASTE

EPA shares responsibility for regulating the transportation of hazardous waste with the U.S. Department of Transportation (DOT) (R-1). Under its authority to regulate the inter- and intrastate shipment of hazardous materials, DOT has developed the Hazardous Materials Transport Regulations (HMTR) which appear in 49 CFR 100-199. After EPA issued its hazardous waste regulations under RCRA, DOT incorporated the EPA regulations concerning waste transporters into the HMTR. Thus, hazardous waste became a subset of the broader class of products and materials regulated under HMTR.

DOT's regulations cover all modes of transportation (air, rail, highway, waterway, and pipeline) and establish requirements for:

- Use of shipping papers.
- Use of proper containers.
- Marking and labelling of containers.
- Placarding of vehicles.
- Reporting of spills and other incidents.

Pre-Transportation Preparation

The shipper or generator is responsible for meeting DOT's requirements for packaging, marking, and labelling of hazardous waste shipments. The regulations set packaging requirements specific to the various types of hazardous materials. Shipping containers constructed to satisfy these standards must be labelled to identify which specifications they meet. Packages prepared for shipping must be clearly marked with the proper shipping name and the identification number of the wastes involved. The identification number is keyed to an emergency response guidebook so that, in the event of an accident, emergency personnel can quickly determine the hazardous material(s) and take appropriate response actions.

In addition to clearly marking each package with the name and identification number of the wastes, packages and containers must be labelled with a color-coded warning sign which serves to alert transportation personnel of the principal hazard of the material or waste they are transporting. The label would show, for example, if the material were explosive, flammable, or corrosive. Placards are also color-coded signs denoting the principal hazard of the materials or wastes being transported. Where labels are affixed to each package or container, placards are placed on the outside of the vehicle. This serves to alert transportation personnel, emergency response teams, and the public to the principal hazard or hazards of the cargo as a whole.

Transportation Requirements

DOT prohibits the shipment of hazardous materials, including hazardous wastes, except in conformance with the packaging, marking, labelling, and shipping requirements set forth in the hazardous materials transport regulations. These include specific requirements for each mode of transportation. HMTR Part 174 (49 CFR 174), for example, covers rail transportation, and includes such requirements as proper bracing and blocking of materials aboard the transporting car and proper segregation of materials. HMTR Part 177 (49 CFR 177) covers transport on public highways, and includes loading requirements to prevent movement of containers within the vehicle and restrictions on materials that can be placed together. In addition to the HMTR, DOT's Motor Carrier Safety Regulations (49 CFR 397) also govern highway transportation of hazardous materials.

APPENDIX B

ARIZONA STATE HAZARDOUS WASTE MANAGEMENT PROGRAM

ADHS has adopted rules, regulations, and standards for the management of hazardous wastes under the authority of Arizona Revised Statutes 36-132.A.12, 36-136.G.11, 36-1707, 36-1855, and 41-1003. These regulations are contained in Arizona Regulations R9-8-1801 to R9-8-1823 (Article 18).*

The state regulations establish a program similar to the federal hazardous waste management program established under RCRA. It includes the definition and listing of hazardous wastes, requirements for a manifest system, transportation of waste, storage, treatment, and disposal of regulated wastes. Any TSD facility operating in the State must have a permit issued by ADHS.

Under the ADHS regulations, permitted facilities must meet design and operation requirements to prevent the discharge or release of hazardous waste, violation of an air quality standard, contamination of ground water, or other problems which may pose a hazard to human health or the environment.

RELATIONSHIP BETWEEN THE STATE AND FEDERAL PROGRAMS

Congress recognized that state governments would have to play a substantial role if the national hazardous waste program were to succeed. Consequently, RCRA provides for both financial assistance to states for developing state regulatory programs, and an authorization process by which EPA can transfer responsibility for the federal program to states.

Congress recognized that development of state programs comparable to the federal program would take time, so RCRA allows for "interim authorization" of a "substantially equivalent" state program until a fully equivalent program is developed. The authorization process is separated into phases to reflect the phased development of the federal program.

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* A copy of the ADHS regulations is available from the Bureau of Waste Control, 1740 W. Adams Street, Phoenix, Arizona.

On August 18, 1982, EPA granted Arizona interim authorization for the first phase of the RCRA program. The authorization gives ADHS authority to carry out inspections and take enforcement actions to ensure that generators, transporters, and "interim status" TSD facilities* comply with federal as well as state regulations. While the state may inspect federally permitted facilities, EPA will continue to issue and enforce federal permits until Arizona is authorized to issue RCRA-equivalent permits. The state plans to apply for its full authorization in 1984.

Currently, EPA and ADHS issue state and federal permits jointly under the terms of a "cooperative arrangement" between the two agencies. The arrangement provides for concurrent review of permit applications by EPA and ADHS, and a joint decision to deny the permit or prepare the draft application. If necessary, ADHS prepares an addendum to the draft permit to incorporate state requirements. ADHS has primary responsibility for carrying out the public participation requirements, though hearings will be jointly held. ADHS will revise the draft permit, as necessary, to reflect public comment.

The decision on the final permit will be jointly made by EPA and ADHS. The EPA Regional Administrator, however, retains ultimate responsibility to approve or deny the RCRA permit, except that a decision by either agency to deny a permit prevails.

STATE TRANSPORTATION REGULATIONS

Arizona has adopted the DOT's Hazardous Materials Transport Regulations as its state regulations governing the transport of hazardous materials, including hazardous wastes. The State Department of Public Safety (DPS) enforces these regulations. DPS inspectors and investigators routinely spot-check haulers for transport violations, and inspect shippers (generators) for compliance with the packaging and labelling requirements.

In adopting the state hazardous waste facility legislation (ARS 36-2800), the Legislature mandated that the ADHS Director promulgate specific regulations governing the travel routes for the transport of hazardous wastes within the state. These regulations should be developed prior to the start of facility operations. ADHS will initiate this process in early 1983, and expects to have the regulations finalized by early 1984. The process of developing transportation regulations will enable ADHS to carefully review data, needs, and public input in order to adopt routing regulations that properly address present and future transportation problems.

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* An "interim status" TSD facility is one which existed when the RCRA regulations took effect and is allowed to operate without an RCRA permit until one can be issued. These facilities must meet standards set forth in 40 CFR 265.

PERMITTING THE PROPOSED FACILITY

ADHS will have a dual role as both regulator of the proposed state-owned facility and co-applicant for the facility permit as owner of the land leased to the operator. Because of its role as co-permittee, ADHS intends to have EPA issue a RCRA permit for this facility. The agencies may enter into a special agreement for issuing this permit. The facility will also have a state permit from ADHS.

ADHS would have primary responsibility for enforcing conditions of the permit at the facility. ADHS staff would regularly inspect the facility, and report their findings to EPA. EPA staff would accompany the state's inspectors or do independent inspections, as needed, to ensure compliance with the federal requirements.

APPENDIX C

HAZARDOUS WASTES IN ARIZONA

INTRODUCTION

The Arizona Department of Health Services (ADHS) estimates that Arizona industries generate over 4,666,000 tons/year of hazardous wastes as by-products of their industrial processes. Hazardous waste producers include most industries in the state's manufacturing sector, including textiles, printing and publishing, chemicals, food processing, primary metals, electrical machinery, plating, and electronics.

Of the wastes currently generated, 4,628,000 tons/year are treated on-site at the generating facility or are discharged directly into a sewer or to waters of the U.S. Table C-1 shows the types and quantities of wastes in this category generated in 1980-81.

The remaining 38,000 tons/year are stored or disposed on-site at the generating facility or are sent off-site for recycling, treatment, storage, or disposal. ADHS refers to these wastes as "non-sewerable," that is, wastes which cannot be safely or legally put into a sewer and which require alternative treatment, recycling, or disposal. These waste types and quantities are shown in Table C-2.

The following hazardous wastes are included in Table C-2:

- A limited amount of exempt small generator waste from voluntary reporting by small-quantity generators.
- Hazardous wastes generated and shipped by treatment, storage, and disposal (TSD) facilities.
- Hazardous wastes stored and/or disposed on-site by TSD facilities.
- Hazardous wastes produced in Arizona by generators that are not TSD facilities, and disposed in accordance with the state hazardous waste regulations.
- Hazardous wastes which are used, reused, recycled, or reclaimed.

TABLE C-1. HAZARDOUS WASTES TREATED ON-SITE OR DISCHARGED (TONS/YEAR)*

Waste Categories†	Treated On-Site	Discharged to Sewers or Waters of U.S.	Total
Ignitable wastes (D001)	69,063	0	69,063
Corrosive wastes (D002)	2,968,891	0	2,968,891
Reactive wastes (D003)	0	0	0
EP Toxic wastes (D004-D017)	103	1	104
Organic solvents, non-specific sources (F001-F005)	12	0	12
Electroplating wastewater and sludges, non-specific sources (F006-F009)	1,472,842	0	1,472,842
Other wastes, non-specific sources (F010-F019)	0	0	0
Wastes from specific sources (K)	0	0	0
Chemical products or manufacturing intermediates (U)	0	0	0
Acutely toxic chemical products or manufacturing intermediates (P)	1	0	1
Hazardous wastes not otherwise defined	116,998	3	117,001
Totals	4,627,910	4	4,627,914

* From: Arizona Department of Health Services. Arizona Hazardous Waste 1981 Annual Generators' Report. 1981.

† Definitions of waste categories are given in 40 CFR 261.21 - 261.33. EPA waste category codes are given in parentheses.

TABLE C-2. NON-SEWERABLE HAZARDOUS WASTES IN ARIZONA (TONS/YEAR, 1980-81)*

Disposed on-site	15,511
Stored on-site[†]	1,246
Recycled off-site	4,770
Treated/disposed off-site	16,569
Disosal/handling method unidentified	146
Total	38,242

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* From: Arizona Department of Health Services. Arizona Hazardous Waste 1981 Annual Generators' Report. 1981.

[†] Storage at end of reporting period.

Table C-2 does not include the following hazardous wastes:

- The majority of exempt small-quantity generator wastes.
- Hazardous wastes treated, sewered, and/or discharged to U.S. waters by on-site TSD facilities.

PROPOSED FACILITY'S POTENTIAL WASTE STREAM

The state's objective in proposing the facility is to provide in-state disposal capacity for non-sewerable wastes generated within the state. In its initial planning efforts, ADHS used preliminary estimates of the types and quantities of non-sewerable wastes currently being generated, and projected a 5 to 10 percent annual growth factor over the next two decades. These estimates, updated by the 1981 generators' report and a 1981 industrial survey, were used for purposes of this EIS. These figures were revised again to reflect late generator reports; Tables C-1 and C-2 show these revised figures.

The following is a discussion of some factors which could affect the actual hazardous wastes to be sent to the proposed facility.

Industrial Growth

The amount of hazardous wastes that will be generated in the state is expected to correlate with industrial growth, especially in the manufacturing sector. Based on Arizona Department of Economic Security projections of manufacturing sector growth (1), ADHS estimates the amount of hazardous wastes generated in the state may increase 5 to 10 percent over the next two decades. The actual rate of industrial growth could be affected by the state of the economy and other factors. The increase in hazardous wastes associated with this growth could be affected by such factors as the extent of on-site recycling/reclamation or changes in the specific wastes regulated.

Potential Hazardous Wastes

A recent marketing survey of Arizona manufacturing firms by the Bureau of Waste Control (BWC) indicates that approximately 92,000 tons of exempt or potentially hazardous wastes are generated annually in Arizona. There are wastes which do not meet the definition of "hazardous waste" under state or federal law and, therefore, are not subject to EPA or ADHS hazardous waste regulations. Nonetheless, these wastes have unique characteristics which may justify special treatment, handling, or disposal procedures. Consequently, some of these wastes may be handled by the hazardous waste facility. These wastes include waste oils and lubricants, alkaline sludges, varnishes, adhesives, solvents, and detergents.

Out-of-State Wastes

Although the state is proposing a facility designed to handle wastes generated within Arizona, waste generators in neighboring states may choose to ship their wastes to the proposed facility. One recent study suggests that approximately 15 percent of the total annual waste quantity likely to be transported to the Arizona facility could come from New Mexico, Colorado, or western Texas.* This is a very rough estimate based on certain assumptions about the waste streams in those neighboring states.

The study points out that a number of factors could influence the types and quantities of wastes actually shipped to the facility, including:

- Trends toward waste reduction and reuse, and the resulting impacts on waste type and quantity transported off-site for disposal.
- Existence, location, capabilities, and timing of other new or expanded commercial hazardous waste management facilities that may be available to generators in these states.
- Gate fee differentials among alternative facilities.
- Haul cost differentials which involve distance, condition of roads, transportation requirements, geography, and labor costs.
- Trends concerning on-site disposal and treatment, and the resulting influences on waste type and quantity transported off-site.
- Timing of industrial waste treatment and disposal capabilities at the Arizona facility.

Variables influencing the potential for import of wastes from California are even more complex. California is a major generator of hazardous wastes, and is in the process of developing a state hazardous waste control program which would restrict or discourage the landfilling of many types of regulated wastes. Also, several disposal facilities in southern California have closed or may close in the near future, leaving this major industrial area without sufficient nearby disposal capacity. These factors could encourage southern California generators to ship their wastes to the Arizona facility. On the other hand, development of new treatment facilities to handle the wastes which have been landfilled in the past, plus other features of the state program, could make it more economically feasible to handle the wastes within California.

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* Preliminary Projections of Hazardous Wastes to be Delivered to Arizona from Selected Out-of-State Sources, SCS Engineers, September 1982. (This report is available upon request from EPA Region 9).

Currently, California has sufficient in-state treatment and disposal capacity to handle wastes generated within the state. For that reason, and because of the complexities involved in assessing the impact of the state's hazardous waste program, California was excluded from the out-of-state waste study cited above.

Out-of-state wastes were not included in the analyses presented in this EIS for the following reasons:

- Arizona is planning the facility based on its in-state waste stream data, and has used this data in developing its Request for Proposals (RFP) from potential facility contractors.
- ADHS is considering methods through which the facility would give higher priority to handling wastes generated in Arizona (e.g., a differential fee structure).
- Given the complexities and the large number of variables involved, it is not practical to make a realistic estimate of the waste types and quantities which could be sent to the facility from outside Arizona.

WASTES EXCLUDED FROM THE FACILITY

Under the provisions of SB 1033 (ARS 36-2802), the following wastes would be specifically excluded from the facility:

- Solid wastes generated by domestic households.
- Radioactive waste materials whose storage, transportation, treatment, and disposal are regulated by the Federal Nuclear Regulatory Commission or the Arizona Radiation Regulatory Agency.

REFERENCE

1. Arizona Department of Health Services, Bureau of Waste Control. Final Report to the Arizona State Legislature Regarding Siting a Statewide Hazardous Waste Disposal Facility. January 1981.

APPENDIX D

REPRESENTATIVE DESIGNS FOR PROPOSED FACILITY

For the purpose of assessing the impacts associated with the proposed land transfer, representative designs were developed for each of the prospective features of the proposed facility. Actual site design and development will be provided by the contractor/operator selected by the state. The prospective features of the proposed state facility, along with the treatment/disposal process suitable to the waste types identified in Appendix C, are given in Table 1-1 (see text). An artist's concept of the proposed facility is shown in Figure D-1.

Table D-1 presents estimated minimum land areas that would be required for the state facility's potential major features. The active portion of the facility (58 acres) is relatively small in comparison to the whole site (Figure D-2). It should be noted that land area estimation is based on projections concerning the quantity of waste which will be generated in Arizona within the next 30 years, and which will be treated and/or disposed off-site. The land area for each treatment or disposal facilty would be substantially increased if out-of-state wastes and/or in-state wastes currently treated/disposed on-site were accepted at the proposed facilty.

The representative designs for surface impoundments (ponds), storage tanks, and landfarm and landfill sites were based on hazardous waste quantities specified in Table D-2. They are designed to meet all of the permitting requirements for land disposal facilities that were recently promulgated.* The solvent recovery facility would comply with regulations relevant to air emissions.

SURFACE IMPOUNDMENTS (PONDS)

Assumptions

- Waste quantity increases at an annual rate of 5 percent.
- Life expectancy of each surface impoundment is 30 years.

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* U.S. Environmental Protection Agency. Hazardous Waste Management System; Permitting Requirements for Land Disposal Facilities. Federal Register, July 26, 1982, pp. 32278-388. See also 40 CFR 122, 260, 264, and 265.

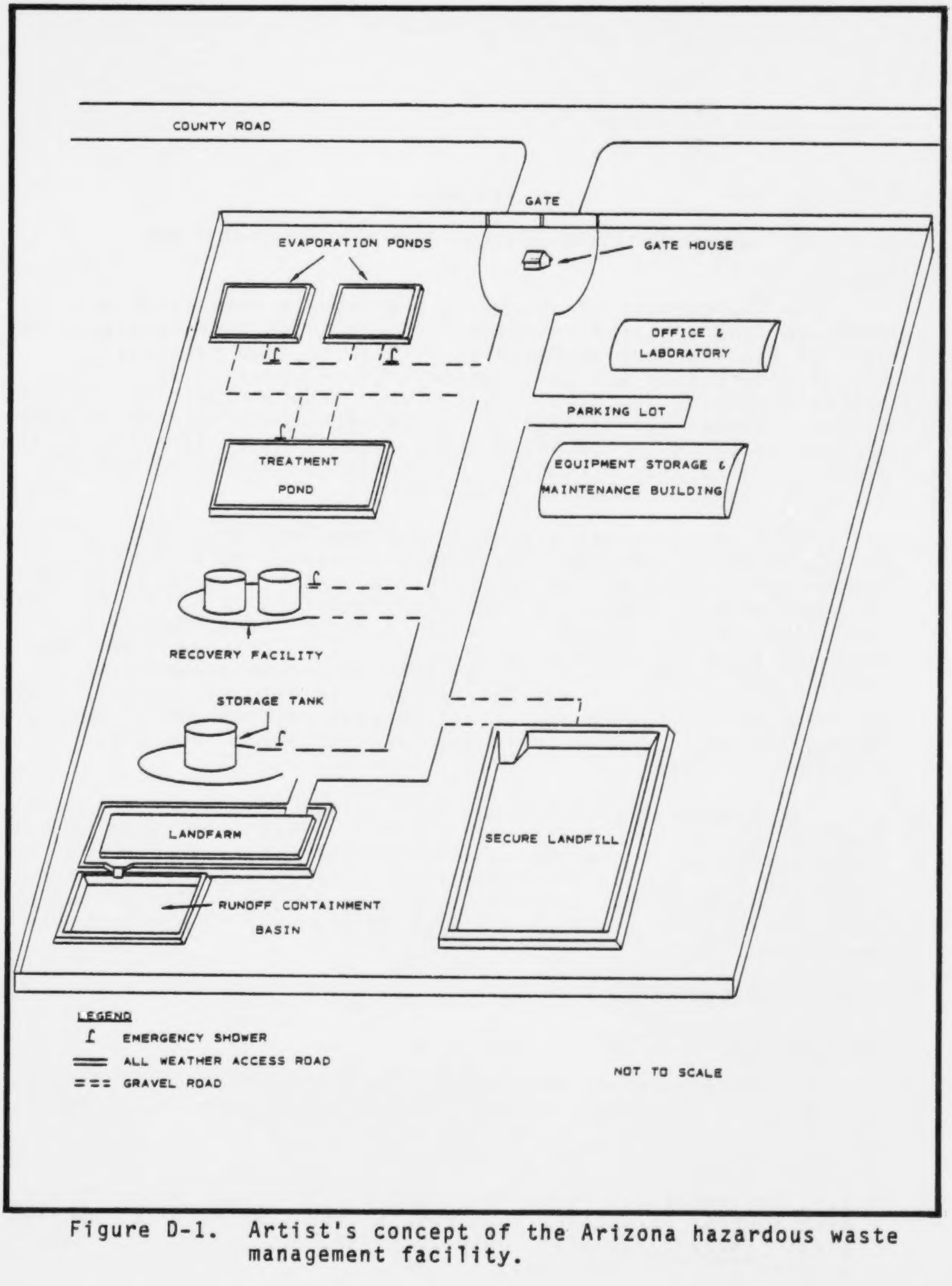

COUNTY ROAD
GATE
EVAPORATION PONDS
GATE HOUSE
OFFICE & LABORATORY
PARKING LOT
TREATMENT POND
EQUIPMENT STORAGE & MAINTENANCE BUILDING
RECOVERY FACILITY
STORAGE TANK
LANDFARM
SECURE LANDFILL
RUNOFF CONTAINMENT BASIN
LEGEND
EMERGENCY SHOWER
ALL WEATHER ACCESS ROAD
GRAVEL ROAD
NOT TO SCALE

Figure D-1. Artist's concept of the Arizona hazardous waste management facility.

TABLE D-1. ESTIMATED LAND AREA REQUIREMENT FOR THE ARIZONA HAZARDOUS WASTE MANAGEMENT FACILITY

Feature	Surface Area (ac)
State Facility	640
Peripheral Buffer Zone*	1920
Surface Impoundment†	14
Recovery Facility†	1
Landfarm†	5
Landfill†	32
Access Road (5280' x 50')	6

* Width of the buffer zone: 2640 ft (see Figure D-2).

† Fifty percent of the land area is devoted to actual treatment and disposal operations. The remaining land area is utilized for construction of the facility's supporting structures: access road, office, laboratory, maintenance shop, storage shed, and parking lot for employees and visitors.

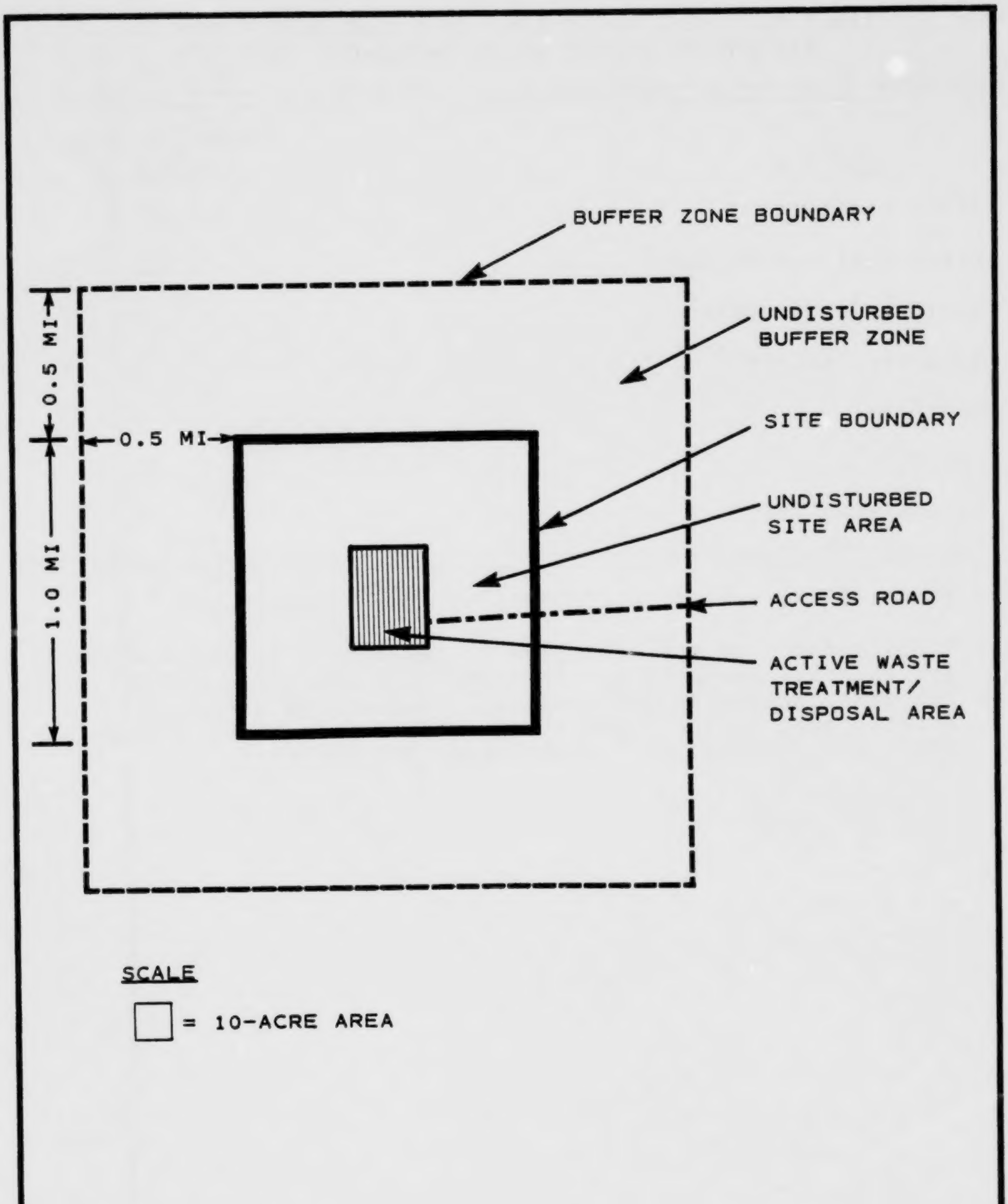

BUFFER ZONE BOUNDARY
UNDISTURBED BUFFER ZONE
SITE BOUNDARY
UNDISTURBED SITE AREA
ACCESS ROAD
ACTIVE WASTE TREATMENT/ DISPOSAL AREA
0.5 MI
0.5 MI
1.0 MI
SCALE
☐ = 10-ACRE AREA

Figure D-2. Relative size of the active portion of the site compared to the undisturbed surroundings.

Table D-2. SUMMARY OF HAZARDOUS WASTE GENERATION[*]

Waste Material	Weight (tons/year)[†]	Calculated Volume[†]
Acids/Alkalis	9,665	2.31 x 10^6 gal/yr
Wastewaters with Heavy Metals	528	0.13 x 10^6 gal/yr
Cyanide Solutions	149	3.58 x 10^4 gal/yr
Various Solvents	300	6.01 x 10^4 gal/yr
Various Biodegradable Organics	238	4.76 x 10^4 gal/yr
Metal Sludges	3,865[#]	0.77 x 10^6 gal/yr
Cyanide Solids	16	330 ft^3/yr
Pesticides	5	102 ft^3/yr
Reactive Wastes	12	238 ft^3/yr
Ignitable Wastes	811	23,169 ft^3/yr
Halogenated Organics	196	6,316 ft^3/yr
Miscellaneous Inorganics and Asbestos	926	14,866 ft^3/yr
Total	16,711	

[*] 1981 data; wastes currently being treated and/or reused on site are excluded.

[†] Rounded to the closest unit.

[#] Assume 10 percent solids

Features Applicable to All Surface Impoundments (see Figure D-3)

- Side slope (horizontal:vertical) is 2:1.
- Freeboard is 2 ft.
- Berm width at top is 6 ft.
- Impoundment is double-lined (Figure D-4):
  - 30-mil Hypalon membrane liner is placed so that it completely covers the bottom and side walls of the pond. Figure D-5 shows anchorage of the liner.
  - Subgrade for the membrane liner is 6 in.
  - 3 ft clay-cement admixed liner is overlaid on the synthetic membrane.
- Leachate detection and removal system is installed between the liners (Figure D-4).

Type and Specific Features of Surface Impoundment

- See Table D-3.

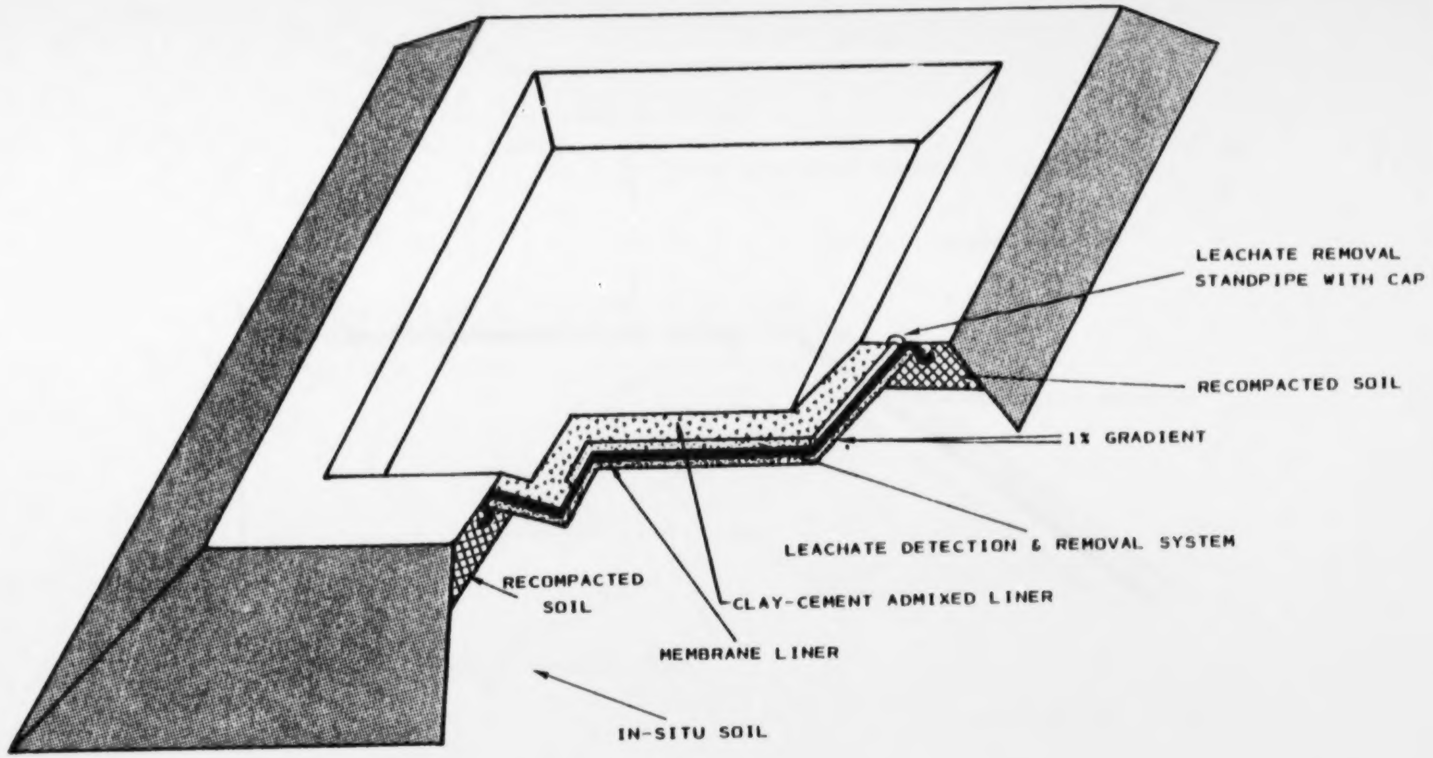
LANDFARM

Assumptions

- Waste quantity increases at an annual rate of 5 percent.
- Wastes to be land-treated contain 8 percent solids, and are handled as liquid.

Basic Design Specifications

- Annual application rate (wet weight basis) is 1,000 tons/ac.
- Operating area, based on estimated quantity of waste to be received in the 30th year (including land area for construction of berms and ditches), is 2.15 ac.
- Storage tank:
  - Purpose: To ensure orderly landfarming activity, and to store waste under inclement weather conditions which prevent landfarming.
  - Capacity: Sufficient to contain 3-month waste quantity.


LEACHATE REMOVAL
STANDPIPE WITH CAP
RECOMPACTED SOIL
1% GRADIENT
LEACHATE DETECTION & REMOVAL SYSTEM
RECOMPACTED
SOIL
CLAY-CEMENT ADMIXED LINER
MEMBRANE LINER
IN-SITU SOIL

NOT TO SCALE

Figure D-3. Surface impoundment construction.

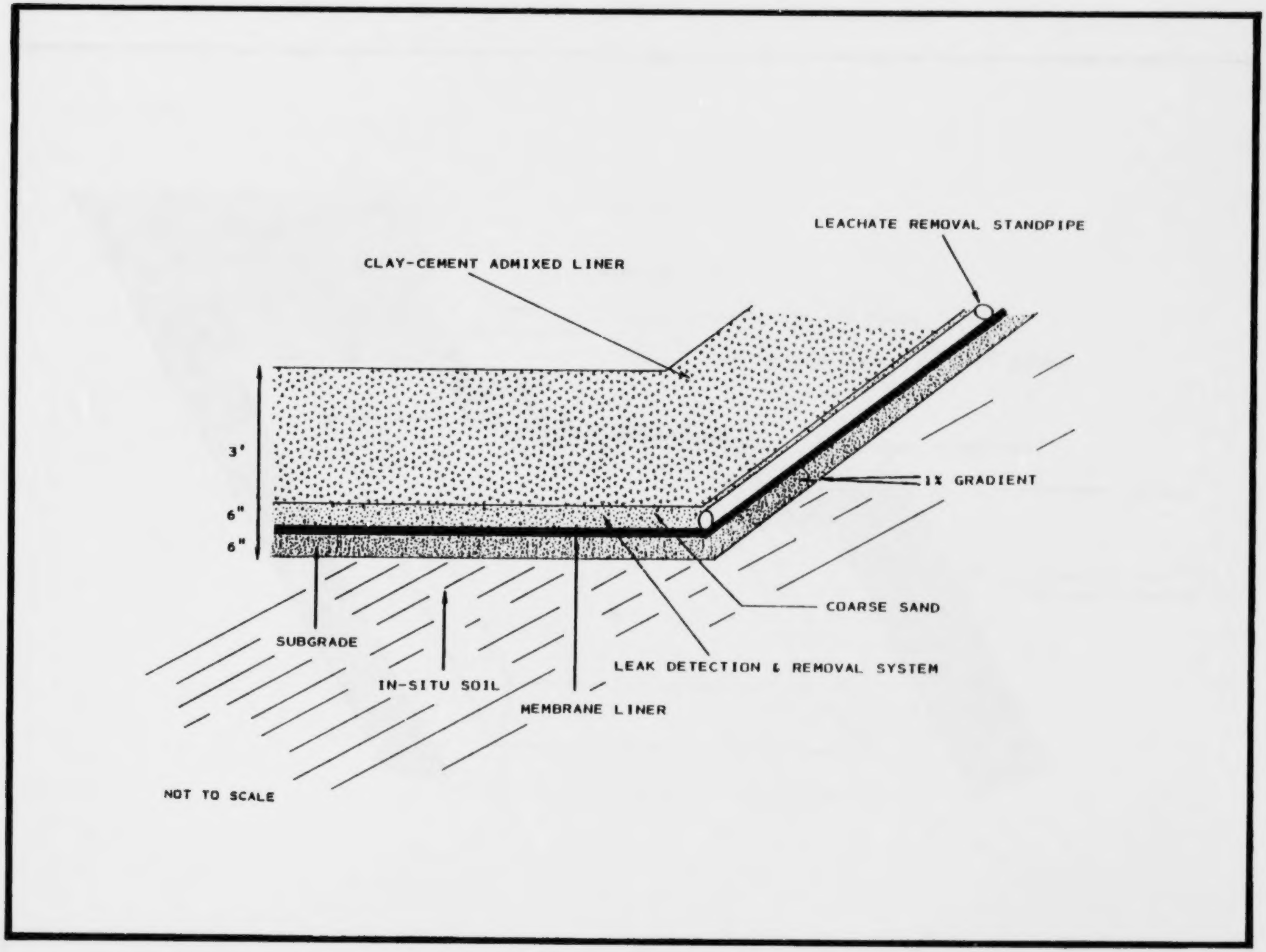
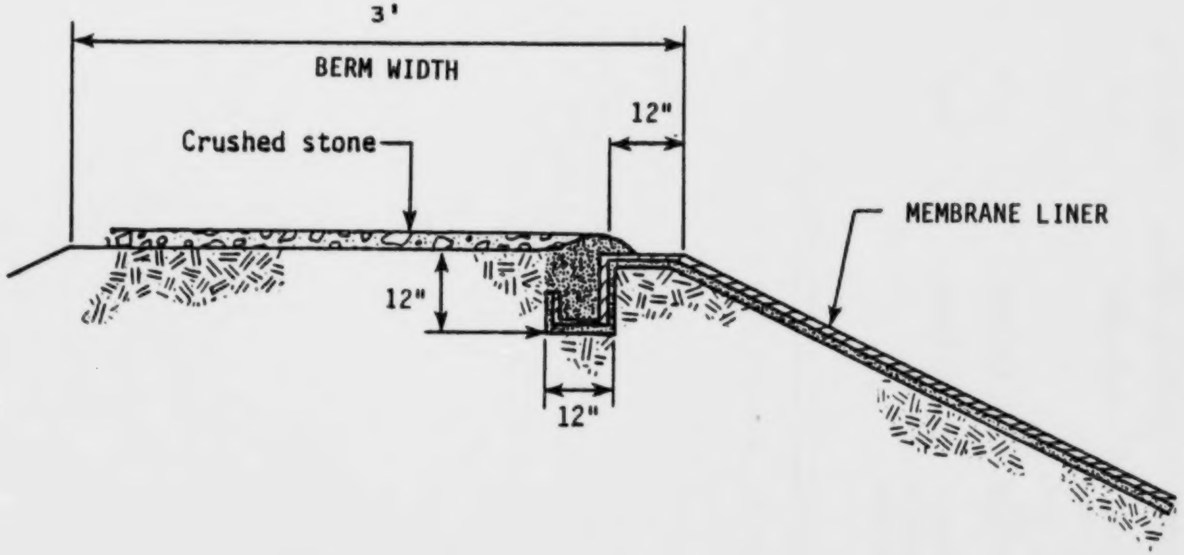

LEACHATE REMOVAL STANDPIPE
CLAY-CEMENT ADMIXED LINER
3'
6"
6"
1% GRADIENT
COARSE SAND
SUBGRADE
LEAK DETECTION & REMOVAL SYSTEM
IN-SITU SOIL
MEMBRANE LINER
NOT TO SCALE

Figure D-4. Double liner and leachate detection and removal system for representative surface impoundments.


3'
BERM WIDTH
12"
Crushed stone
MEMBRANE LINER
12"
12"

NOT TO SCALE

Figure D-5. Membrane liner anchorage.

TABLE D-3. CHARACTERISTIC FEATURES OF SURFACE IMPOUNDMENTS

Waste Material	Treatment/ Disposal Method	Surface Impoundment Capacity (gal)*	Surface Area (ac)†	Operating Depth (ft)
Acids/Alkalis	Neutralization/ Evaporation Pond	9,980,000	6.2	6.0
Wastewater with Heavy metals	Evaporation Pond	572,000	0.59	6.0
Cyanide Solutions	Biochemical and Chemical Destruction/Evaporation Pond	175,000	0.27	6.0

* Based on estimated quantity to be received in the 30tn year.

† Including perimeter berms.

- Design: Above-ground 20,000-gallon concrete tank with cover to minimize odor and with access for pumpage and periodic cleanout.

- Pollution control measures (Figure D-6):
  - Run-on diversion berms (perimeter berms):
    Height is 3 ft
    Width (top) is 10 ft
    Side slope (horizontal:vertical) is 3:1.
  - Runoff collection ditches:
    Depth is 2 ft
    Width (top) is 6 ft
    Side slope (horizontal:vertical) is 2:1.
  - Runoff containment basins:
    Capacity sufficient to contain runoff water from a 25-year, 24-hour rainstorm
    Operating area is 1,000 ft^2
    Operating depth is 2 ft
    Side slope (horizontal:vertical) is 2:1.

SECURE LANDFILL

Assumptions

- Waste quantity increases at an annual rate of 5 percent.
- Fill efficiency (volume efficiency) is 50 percent.
- Incompatible wastes are placed in separate subcells.
- All wastes will be treated prior to landfilling by stabilization, fixation, solidification, etc.

Basic Design Specifications

- Site Area and Volume Requirements:
  - The landfill has five separate subcells due to waste incompatibility (Table D-4 and Figure D-7).
  - Total volume requirement is 13,508,000 ft^3.
  - Landfill depth is 33 ft.
  - Surface area required for disposal operation, including perimeter berms, is 16 ac.
- Landfill Construction:
  - Cell excavation (Figure D-7).

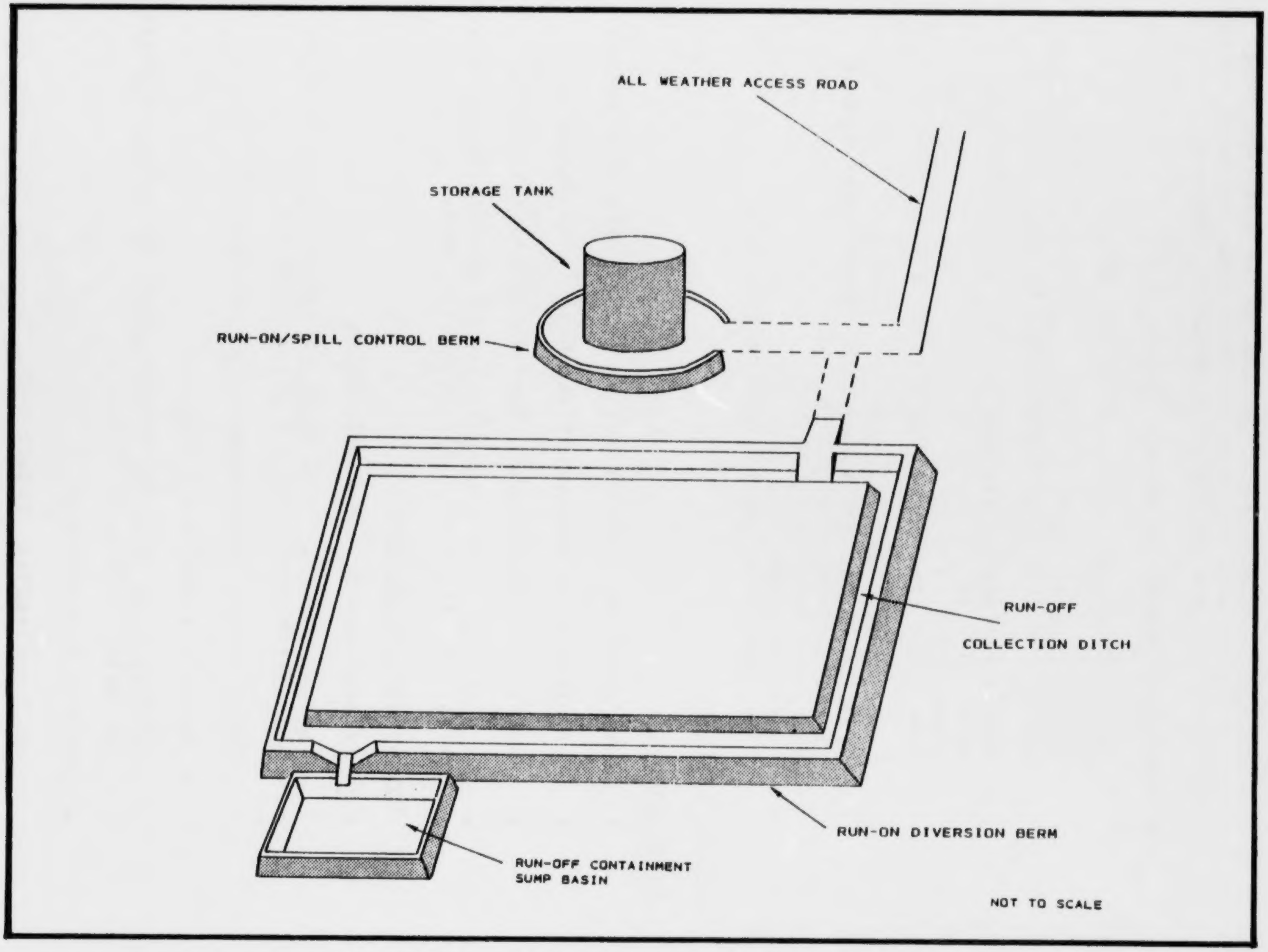

ALL WEATHER ACCESS ROAD
STORAGE TANK
RUN-ON/SPILL CONTROL BERM
RUN-OFF
COLLECTION DITCH
RUN-ON DIVERSION BERM
RUN-OFF CONTAINMENT
SUMP BASIN
NOT TO SCALE

Figure D-6. Landfarm construction details.

TABLE D-4. ARIZONA WASTES AMENABLE TO LANDFILLING

	Estimated Quantity (ft^3)		Waste Segregation	
Waste Type	Base Line*	30-Year Accumulation†	Cell No.	Cell Capacity (ft^3)
Cyanide Solids	330	23,034	1	23,000
Reactive Wastes	238	16,612	2	16,600
Ignitable Wastes	23,169	1,617,196	3	1,618,000
Pesticides	102	7,120	4	448,000
Halogenated Organics	6,316	440,856	4	
Metal Sludges	51,740#	3,611,452	5	4,650,000
Misc. Inorganics and Asbestos	14,866	1,037,647	5	

* 1981 data.

† Assumes that waste generation increases at an annual rate of 5 percent.

# Assumes that 50 percent volume remains after fixation/solidification.

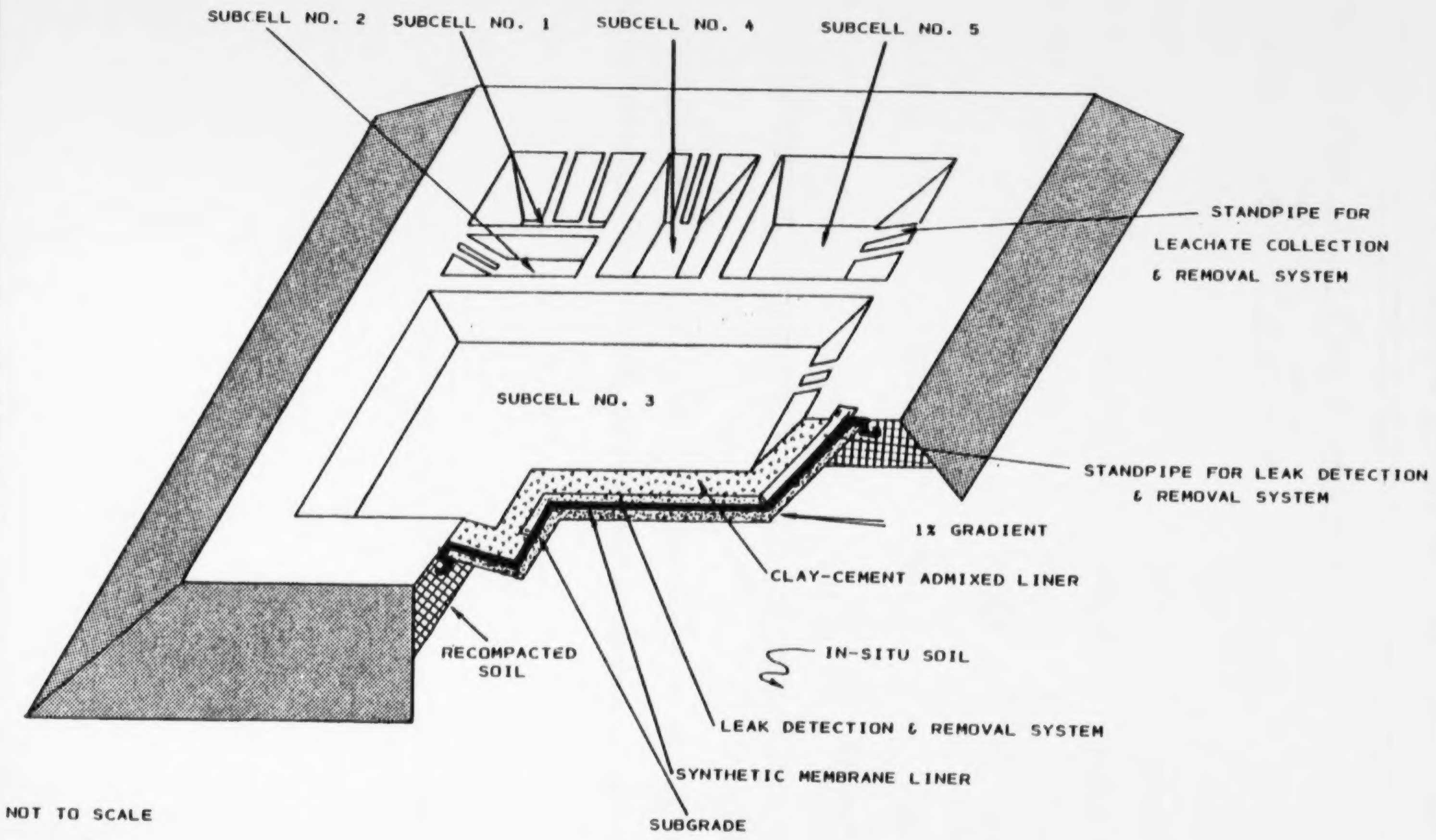

SUBCELL NO. 2
SUBCELL NO. 1
SUBCELL NO. 4
SUBCELL NO. 5
STANDPIPE FOR LEACHATE COLLECTION & REMOVAL SYSTEM
SUBCELL NO. 3
STANDPIPE FOR LEAK DETECTION & REMOVAL SYSTEM
1% GRADIENT
CLAY-CEMENT ADMIXED LINER
RECOMPACTED SOIL
IN-SITU SOIL
LEAK DETECTION & REMOVAL SYSTEM
SYNTHETIC MEMBRANE LINER
SUBGRADE
NOT TO SCALE

Figure D-7. Secure landfill construction details.

- Surface dimension is 835 ft x 835 ft.
- Landfill depth is 33 ft.
- Side slope (horizontal:vertical) is 2:1.
- Perimeter berm:
  - Height is 2 ft
  - Width (top) is 6 ft.
- Landfill will be divided into five separate subcells by clay berms (after liner system is installed).
- Double liner system with a leachate detection and removal system between liners will be installed (Figure D-8).
- A leachate collection system will be installed above the clay-cement liner to remove accumulated rainfall water.

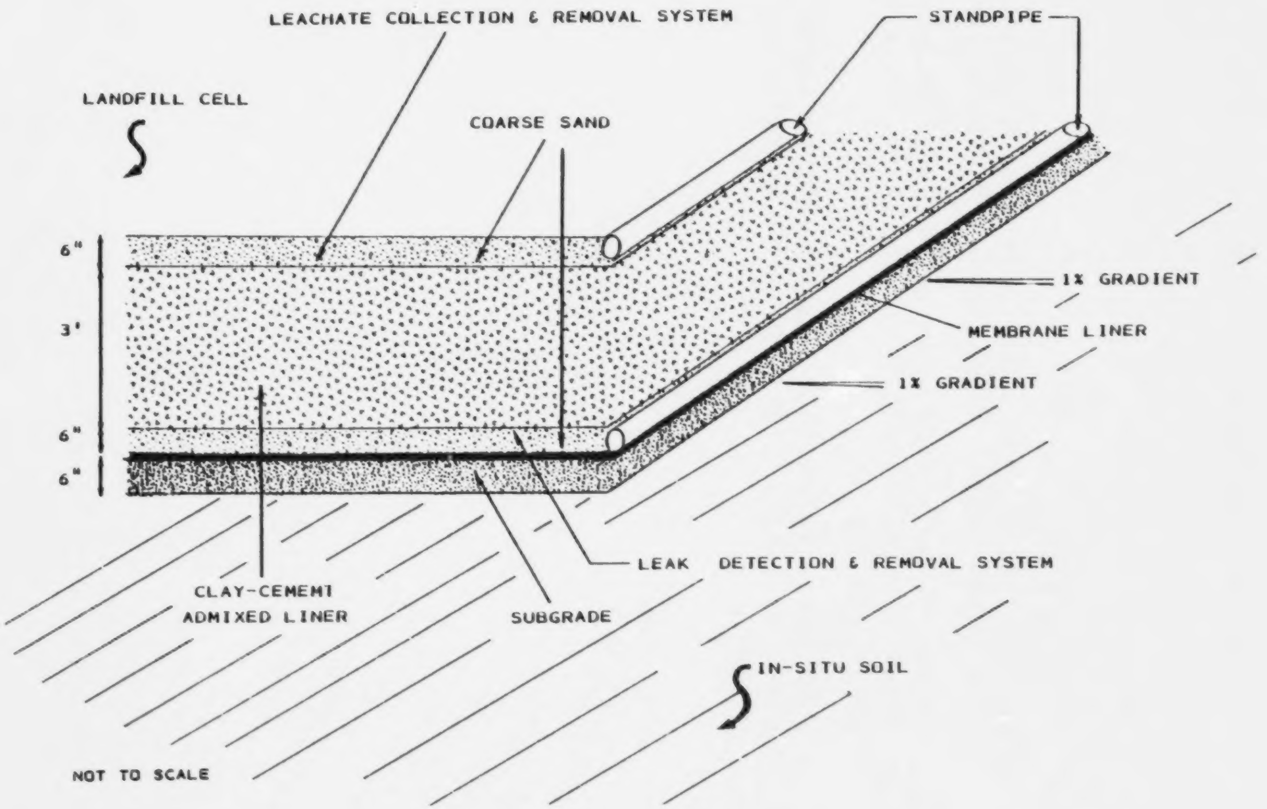

LEACHATE COLLECTION & REMOVAL SYSTEM
STANDPIPE
LANDFILL CELL
COARSE SAND
6"
3'
6"
6"
1% GRADIENT
MEMBRANE LINER
1% GRADIENT
LEAK DETECTION & REMOVAL SYSTEM
CLAY-CEMENT ADMIXED LINER
SUBGRADE
IN-SITU SOIL
NOT TO SCALE

Figure D-8. Double liner and leachate detection/collection/removal systems for the representative secure landfill.

APPENDIX E

FINANCIAL LIABILITY

All insurance policies obtained by the facility contractor would be based on federal and state regulations, and ADHS requirements for the contract from the date of its formation to its completion or termination. The types of insurance expected to be obtained by the contractor are Comprehensive General Bodily Injury and Property Damage Liability Insurance.

This would include bodily injury or property damage arising from the discharge, dispersal, release, or escape of smoke, vapors, soot, fumes, acids, alkalis, toxic chemicals, liquids or gases, waste materials or other irritants, contaminants, or pollutants into or upon land, the atmosphere, or any water course or body of water.

Excess liability insurance may also be required. If the successful contractor were self-insured for primary liability and property damage coverage, negotiations would be required with ADHS and the Arizona Department of Administration's Risk Management Division to satisfy the state's statutory requirements. All worker's compensation and employer's liability coverages and limits would have to conform to Arizona's statutory requirements. In addition, the contractor may be required to submit to ADHS a performance bond to be used to compensate ADHS for any operational or legal expenses incurred in the event of default by the contractor. The bond would be returned when the initial facility contract obligation has been fulfilled.

Since the land for the proposed facility will remain under state ownership, the state will have inherent responsibility for the site, and will concurrently be covered by its existing self-insurance coverage.

APPENDIX F

WATER RESOURCES SUMMARY OF THE PROPOSED MOBILE HAZARDOUS WASTE FACILITY SITE

(Partial reprint of ADHS report dated May 1982.
Copies of the full report are available from
ADHS, Bureau of Waste Control, 1740 West Adams Street,
Phoenix, Arizona 85007)

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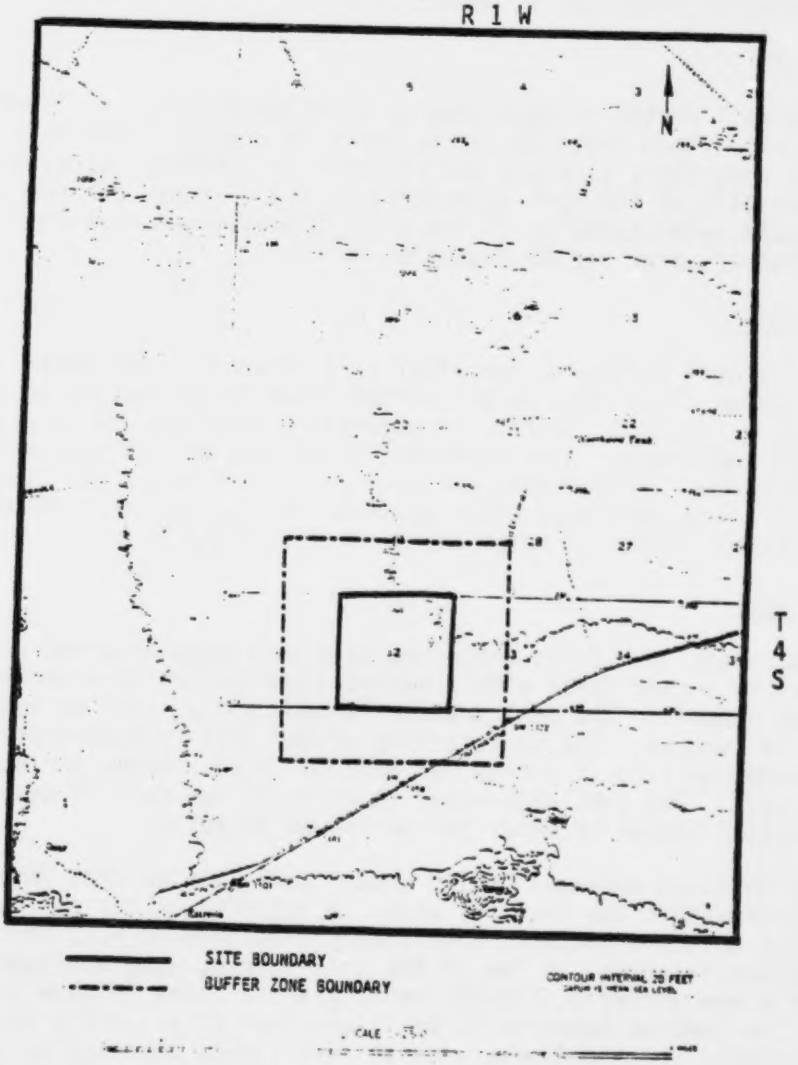
INTRODUCTION

The purpose of this report is to summarize the water resources data for the proposed Mobile Hazardous Waste Facility Site and Waterman Wash Basin, Arizona. The report includes a summary of the soils, geology, ground water and surface water. The data included in the summary is a compilation of in-house and/or available data. Very little new data was generated for this report. But, an analysis of the data and recommendations for future data needs are included in the summary. The references used in this report are in appendix F.

The facility site is located in Mobile Valley, a geographic subpart of Waterman Wash Basin. The township for the facility site is section 32 of Township 4 south, Range 1 west. The USGS 7.5 minute topographic maps for the facility site and surrounding watershed are listed in the following: Mobile, Butterfield Pass, Estrella and Conley Well.

Figure I-1: Proposed Mobile Hazardous Waste Facility Site


R 1 W
N
22
28
27
32
34
T 4 S
SITE BOUNDARY
BUFFER ZONE BOUNDARY
CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

SOILS

The U.S. Soil Conservation Service conducted a soil survey suitable for general planning purposes in Maricopa County, which included the Waterman Wash Basin (Hartman, 1973). Additional soil data was collected by Roesler (1981) through site-specific soil borings conducted on the facility site. The soil association from the SCS survey, which is most abundant on the facility site, is the Gilman-Estrella-Avondale Association (Figure 1-1).

The Gilman-Estrella-Avondale Association is described by Hartman (1973) as nearly level (less than 1 percent), very hot, very dry, deep loam and clay loam soils on broad valley plains and flood plains. The soils have been formed in recent alluvium derived from the surrounding mountains (i.e., granite and gneiss). The Association has the following percentage composition: 55% Gilman, 15% Estrella, 10% Avondale and 20% others. The soil properties are listed below and summarized in Table 1-1. The hydrologic group for the soils is B (i.e., moderate transmission rate). The erosion hazard is slight to moderate and the re-vegetation potential is good.

Gilman Soil

The Gilman soil series is described as a yellowish-brown to light yellowish-brown loam about 60 inches thick or greater. The soil profile is moderately alkaline and slightly to strongly calcareous. The permeability of the soil is moderate (.6-2.0 inches per hour). The available water capacity of the soil is considered high (9.6-10.8 inches of water per 60 inches of soil).

Estrella Soil

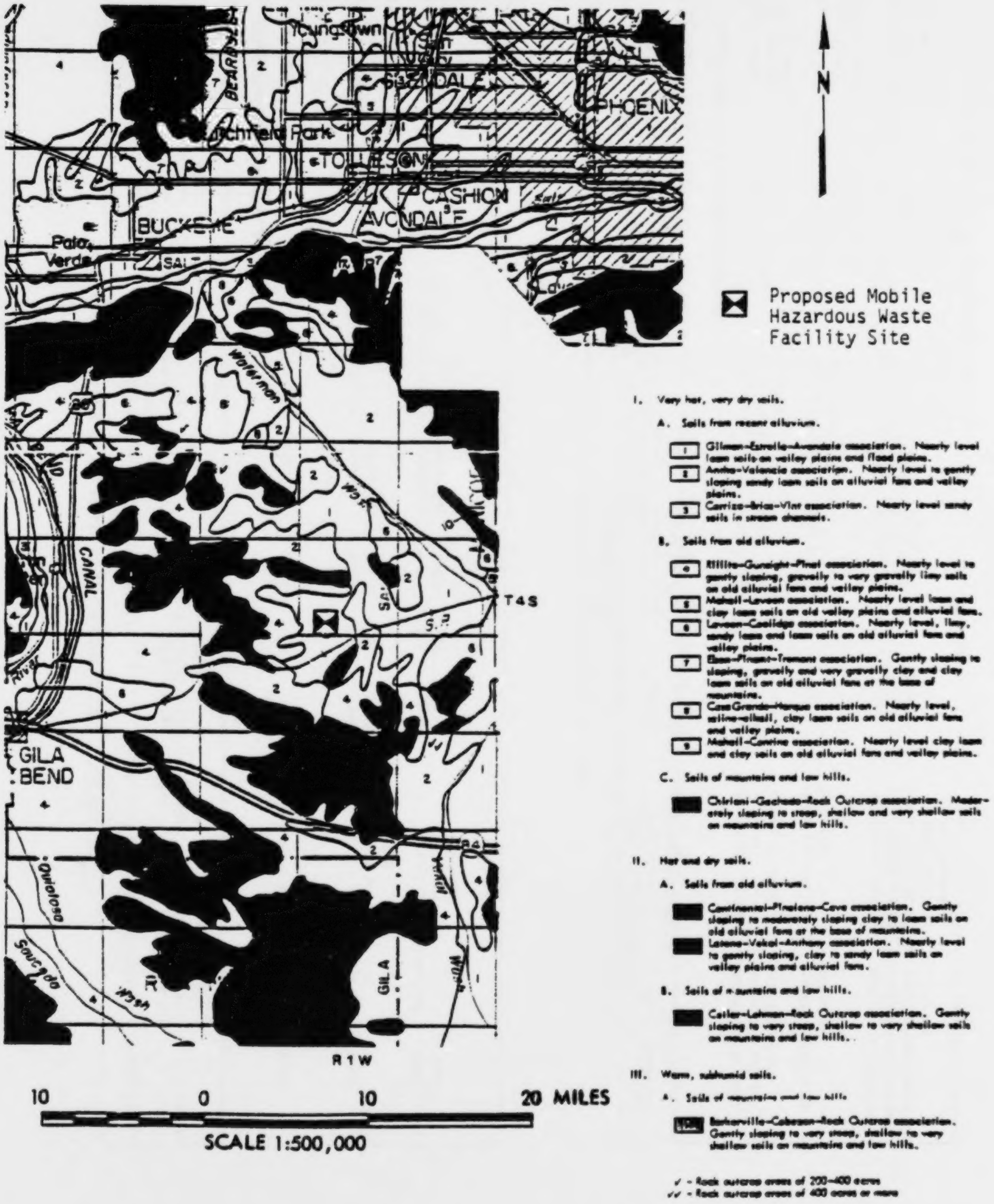
The Estrella soil series is described as a brown to light brown loam about 24 inches thick with an old buried brown to yellowish-red clay loam subsoil. The soil profile is moderately alkaline and slightly to strongly calcareous. The permeability of the soil is moderately slow to moderate (.2-.6 inches per hour to .6-2.0 inches per hour respectively). The available water capacity of the soil is considered high (10.3-11.5 inches of water per 60 inches of soil).

Avondale Soil

The Avondale soil series is described as a dark grayish-brown clay loam about 12 inches thick with a buried light yellowish-brown to a pale brown subsoil. The soil profile is moderately alkaline and strongly calcareous. The permeability of the soil is moderately slow to moderate (.20-.6 inches per hour to .6-2.0 inches per hour respectively). The available water capacity of the soil is considered high (9.5-11.0 inches of water per 60 inches of soil).

Roesler (1981) obtained numerous "split spoon" soil samples from three 150 foot deep soil borings within the facility site. A majority of the soil samples were field-logged for moisture content, consistency, reaction to HCl, particle shape and textural classification. A few of the soil samples were analyzed in a soil laboratory for sieve analysis, liquid limit, plastic index (Figure 1-2 and Appendix H). The samples appeared to be finegrained (i.e., silty to clayey sands) with abundant clays, which conforms with White's (1963) description of the upper 200 feet of the vadose zone.

Figure 1-1: Maricopa general soil map
(Hartman, 1973)



☒ Proposed Mobile Hazardous Waste Facility Site

I. Very hot, very dry soils.

A. Soils from recent alluvium.

- 1 Gilman–Estrella–Avondale association. Nearly level loam soils on valley plains and flood plains.
- 2 Antho–Valencia association. Nearly level to gently sloping sandy loam soils on alluvial fans and valley plains.
- 3 Carrizo–Brios–Vint association. Nearly level sandy soils in stream channels.

B. Soils from old alluvium.

- 4 Rillito–Gunsight–Pinal association. Nearly level to gently sloping, gravelly to very gravelly limy soils on old alluvial fans and valley plains.
- 5 Mohall–Laveen association. Nearly level loam and clay loam soils on old valley plains and alluvial fans.
- 6 Laveen–Coolidge association. Nearly level, limy, sandy loam and loam soils on old alluvial fans and valley plains.
- 7 Ebon–Pinamt–Tremant association. Gently sloping to sloping, gravelly and very gravelly clay and clay loam soils on old alluvial fans at the base of mountains.
- 8 Casa Grande–Harqua association. Nearly level, saline-alkali, clay loam soils on old alluvial fans and valley plains.
- 9 Mohall–Contine association. Nearly level clay loam and clay soils on old alluvial fans and valley plains.

C. Soils of mountains and low hills.

- ■ Cherioni–Gachado–Rock Outcrop association. Moderately sloping to steep, shallow and very shallow soils on mountains and low hills.

II. Hot and dry soils.

A. Soils from old alluvium.

- ■ Continental–Pinaleno–Cave association. Gently sloping to moderately sloping clay to loam soils on old alluvial fans at the base of mountains.
- ■ Latene–Vekol–Anthony association. Nearly level to gently sloping, clay to sandy loam soils on valley plains and alluvial fans.

B. Soils of mountains and low hills.

- ■ Cellar–Lehmans–Rock Outcrop association. Gently sloping to very steep, shallow to very shallow soils on mountains and low hills.

III. Warm, subhumid soils.

A. Soils of mountains and low hills

- ■ Barkerville–Cabezon–Rock Outcrop association. Gently sloping to very steep, shallow to very shallow soils on mountains and low hills.

✓ - Rock outcrop areas of 200–400 acres
✓✓ - Rock outcrop areas of 400 acres or more

Table 1-1: Properties of soils (Hartman, 1973)

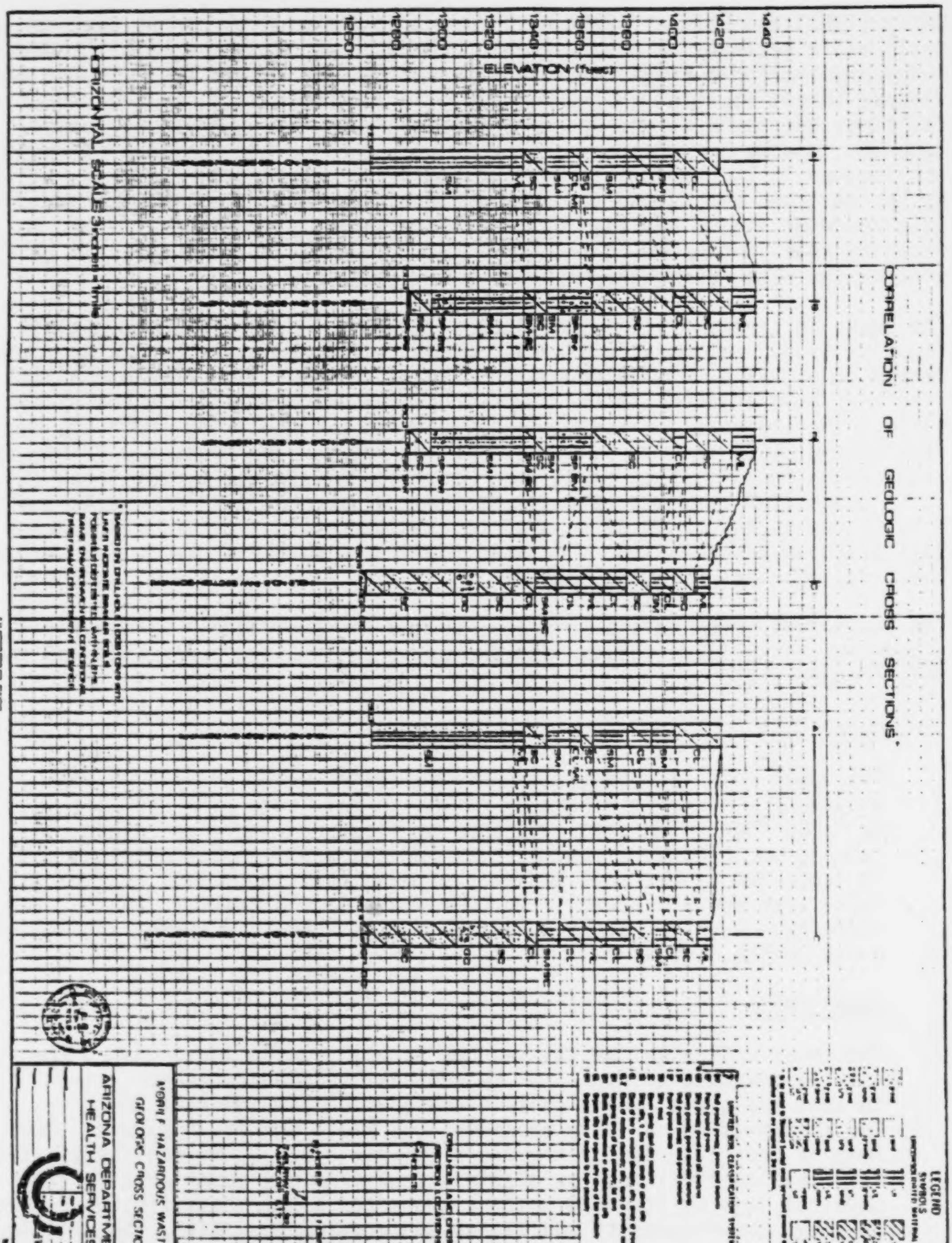
ESTIMATED PROPERTIES OF THE SOILS, OTHER FEATURES AND SOIL SUITABILITIES

Map Symbol and Major Soil Components	Estimated Properties of the Soils								Other Features	Suitability as a Source of:		
	Depth from Surface (in)	Texture	Permeability (in/hr)	Available Water Capacity (profile) (in)	Shrink-Swell Potential	Soil Reaction pH	Corrosivity		Hydrologic Group	Roadfill	Sand &/or Gravel 1/	Topsoil
							Uncoated Steel	Concrete				
1. Gilman-Estrella-Avondale Association												
Gilman loam 0-1% slopes (55% of Unit)	0-60	l	.6-2	9.6-10.8	Low	7.9-8.4	High	Low	B	Fair: ML soil material	Unsuited	Good
Estrella loam 0-1% slopes (15% of Unit)	0-24 24-60	l cl	.6-2 .2-.6	10.3-11.5	Low Moderate	7.9-8.4 7.9-8.4	High High	Moderate Moderate	B	Fair: ML soil material	Unsuited	Good
Avondale clay loam, 0-1% slopes (10% of Unit)	0-12 12-60	cl l	.2-.6 .6-2	9.5-11.0	Moderate Moderate	7.9-8.4 7.9-8.4	High High	Low Low	B	Fair: ML & CL soil material	Unsuited	Fair: clay loam

INTERPRETATIONS OF ENGINEERING PROPERTIES OF THE SOILS FOR COMMUNITY USES

Map Symbol and Major Soil Components	Soil Limitation Rating and Restrictive Features Affecting Engineering Uses for:					
	Sanitary Facilities			Community Development		
	Septic Tank 1/ Absorption Field	Sewage Lagoons	Sanitary Landfills (Trench)	Shallow Excavations	Dwellings 2/ (Without Basements)	Local Roads & Streets
1. Gilman-Estrella-Avondale Association						
Gilman loam 0-1% slopes (55% of Unit)	Slight: severe where flooded	Moderate: severe where flooded	Slight: severe where flooded	Slight: severe where flooded	Moderate: ML soil material: severe where flooded	Moderate: ML soil material; severe where flooded
Estrella loam 0-1% slopes (15% of Unit)	Severe: moderately slow permeability	Moderate: ML soil material	Slight	Slight	Moderate: ML soil material	Moderate: ML soil material
Avondale clay loam 0-1% slopes (15% of Unit)	Severe: moderately slow permeability, some areas flooded	Slight: severe where flooded	Slight: severe where flooded	Slight severe where flooded	Moderate: moderate shrink-swell potential, ML, CL material severe where flooded	Moderate: moderate shrink-swell potential severe where flooded

Figure 1-2: Soil cross sections


CORRELATION OF GEOLOGIC CROSS SECTIONS*
ELEVATION (feet)
1440
1420
1400
1380
1360
1340
1320
1300
1280
1260
HORIZONTAL SCALE 3 inches = 1 mile
LEGEND
MOBILE HAZARDOUS WASTE SITE
GEOLOGIC CROSS SECTIONS
ARIZONA DEPARTMENT OF HEALTH SERVICES

GEOLOGY

White (1963) and Wilson (1979) have described the geology of the Waterman Wash Basin as it pertains to groundwater. The basin is located within the Basin and Range physiographic province of Arizona having been formed by northwest trending reverse thrust faulting and normal faulting (Figure 2-1). As a result of the faulting, the basin is bounded by outcrops of mountains which are composed of Precambrian igneous and metamorphic rock (i.e., granite and gneiss). These outcrops are located in the following areas of the Basin: north by the Buckeye Hills, west by the Maricopa Mountains, south by the Booth and Hayley Hills, southwest by the Palo Verde Mountains and east by the Sierra Estrella Mountains (Figure 2-2). The facility site is bounded on the north, west and south by the Maricopa Mountains and east by the West Prong Waterman Wash.

The Basin is partly filled with unconsolidated to moderately consolidated sedimentary deposits (i.e., well graded gravels, sands, silts and clays) which are commonly referred to as basin-fill (also referred to as valley-fill). The basin fill is generally very thin adjacent to the mountain fronts and is deeper in the middle of the basin. The thickness of the basin-fill ranges between 1,000 and 2,000 feet, but it does exceed 2,000 feet in some areas of the Basin. The thickness of the basin-fill beneath the facility site could range between 500 and 1,000 feet thick (Wilson, 1979). It is speculated that the relative thinness of the basin-fill beneath the facility site is due to the presence of a buried pediment. This geologic situation may be similar to an area studied by Lausten (1974) who documented a buried pediment and an inactive fault scarp in the McDowell Mountains, Paradise Valley, Arizona.

The Basin-fill comprise the principal aquifer in the Basin. Wilson (1979) has divided the basin-fill deposits into two basic units: the upper unit and the lower unit (Figure 2-3).

Upper Unit

The upper unit is composed of unconsolidated sandy clay to gravel and sand. This unit generally ranges in thickness from 800 feet to 1,000 feet. The upper 200 feet of this unit is fine-grained containing an abundant amount of clay (White, 1963). This observation is supported by textural analyses of deep (150 feet) soil borings which were conducted within the facility site by Roesler (1981). But, there have been no laterally extensive clay beds discovered in the Basin (White, 1963).

Lower Unit

The lower unit overlies the bedrock (i.e., granite and gneiss). The unit is composed of poorly to moderately consolidated sandy gravel to sand and gravel which contain small quantities of silt and clay. The thickness is variable exceeding 500 feet, but could exceed 1,000 feet in central areas of the Basin (Wilson, 1979). Wilson (1979) stated that the lower unit can be distinguished from the upper unit in geophysical logs by its more uniform and often higher resistivity, higher density, lower porosity and higher sonic velocity. Also, the drilling time shows a marked decrease in the rate of penetration in the lower unit.

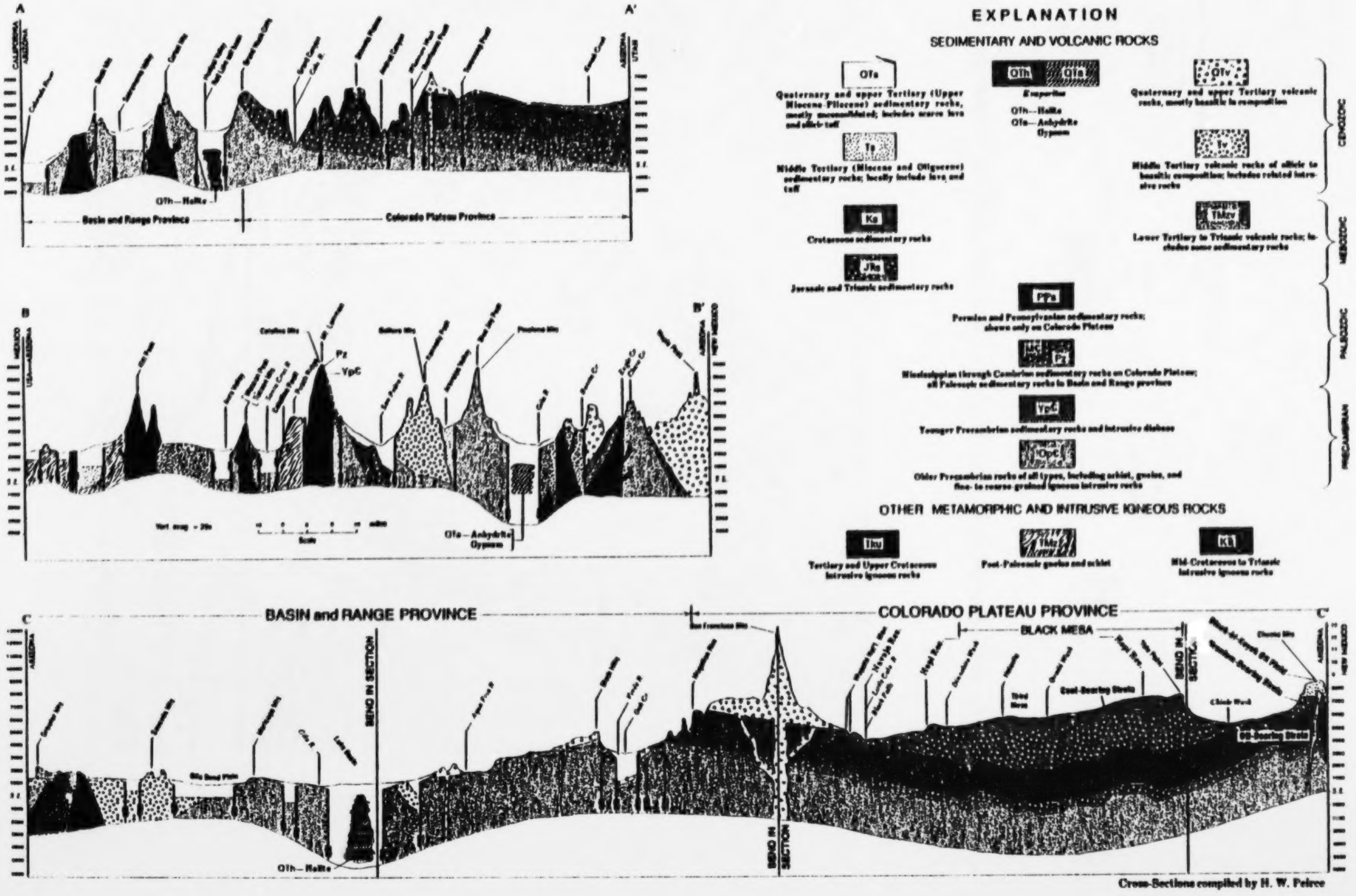

A
A'
CALIFORNIA
ARIZONA
ARIZONA
UTAH
Qth—Halite
Basin and Range Province
Colorado Plateau Province
B
B'
MEXICO
USA—ARIZONA
ARIZONA
NEW MEXICO
Pz
YpC
Qta—Anhydrite Gypsum
Vert. exag. = 20x
Scale
EXPLANATION
SEDIMENTARY AND VOLCANIC ROCKS
QTs
Quaternary and upper Tertiary (Upper Miocene-Pliocene) sedimentary rocks, mostly unconsolidated; includes scarce lava and silicic tuff
QTh
QTa
Evaporites
QTh—Halite
QTa—Anhydrite Gypsum
QTv
Quaternary and upper Tertiary volcanic rocks, mostly basaltic in composition
Ts
Middle Tertiary (Miocene and Oligocene) sedimentary rocks; locally include lava and tuff
Tv
Middle Tertiary volcanic rocks of silicic to basaltic composition; includes related intrusive rocks
CENOZOIC
Ks
Cretaceous sedimentary rocks
TMzv
Lower Tertiary to Triassic volcanic rocks; includes some sedimentary rocks
Jks
Jurassic and Triassic sedimentary rocks
MESOZOIC
PPs
Permian and Pennsylvanian sedimentary rocks; shown only on Colorado Plateau
Pz
Mississippian through Cambrian sedimentary rocks on Colorado Plateau; all Paleozoic sedimentary rocks in Basin and Range province
PALEOZOIC
YpC
Younger Precambrian sedimentary rocks and intrusive diabase
OpC
Older Precambrian rocks of all types, including schist, gneiss, and fine- to coarse-grained igneous intrusive rocks
PRECAMBRIAN
OTHER METAMORPHIC AND INTRUSIVE IGNEOUS ROCKS
TKu
Tertiary and Upper Cretaceous intrusive igneous rocks
TMz
Post-Paleozoic gneiss and schist
Ki
Mid-Cretaceous to Triassic intrusive igneous rocks
C
C'
BASIN and RANGE PROVINCE
COLORADO PLATEAU PROVINCE
BEND IN SECTION
BLACK MESA
Coal-Bearing Strata
Oil-Bearing Strata
QTh—Halite
ARIZONA
NEW MEXICO
Cross-Sections compiled by H. W. Peirce

Figure 2-1: geologic cross section of the Basin & Range physiographic province (Wilson, 1957)

Figure 2-2: geologic map (Wilson, 1957)

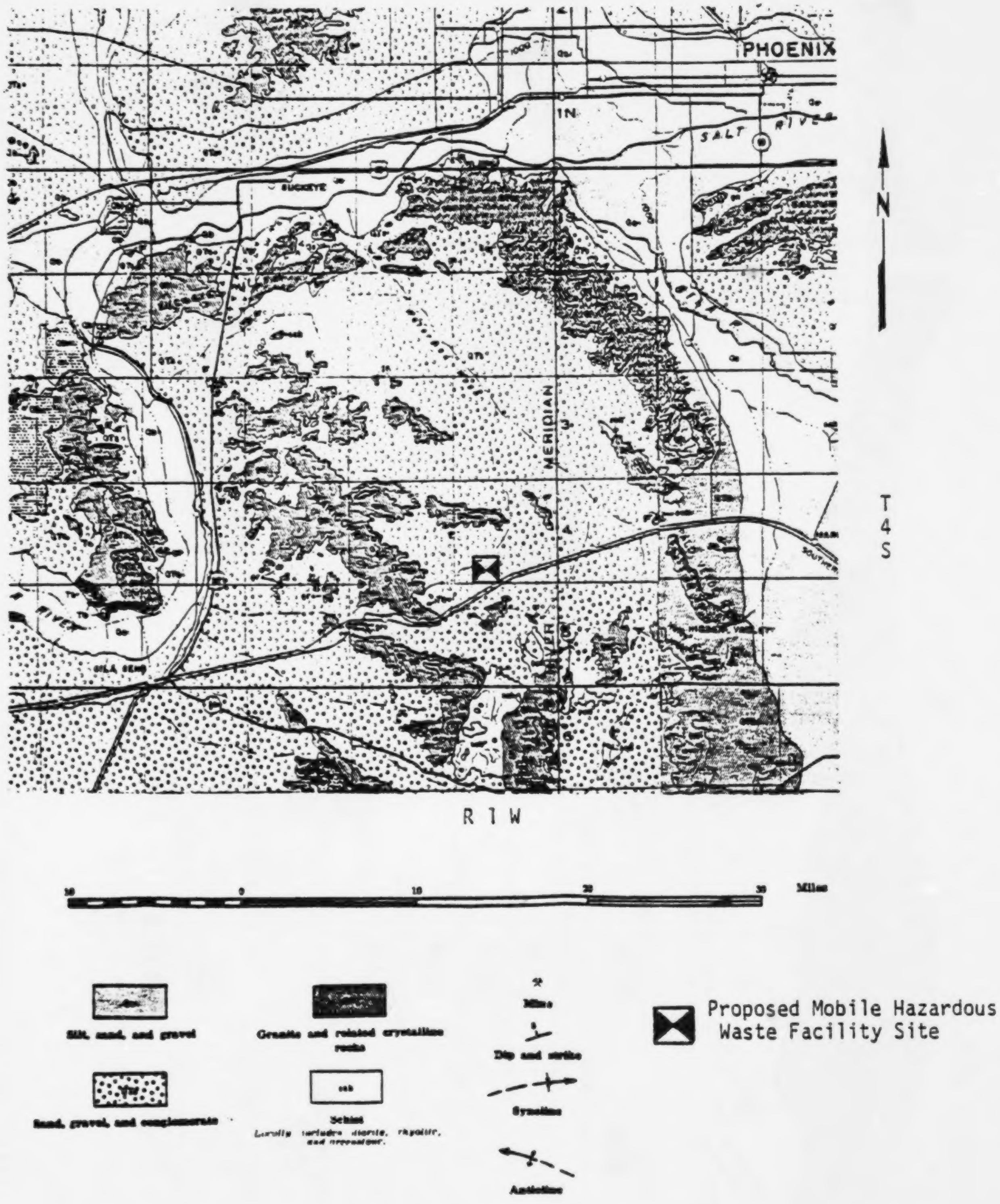
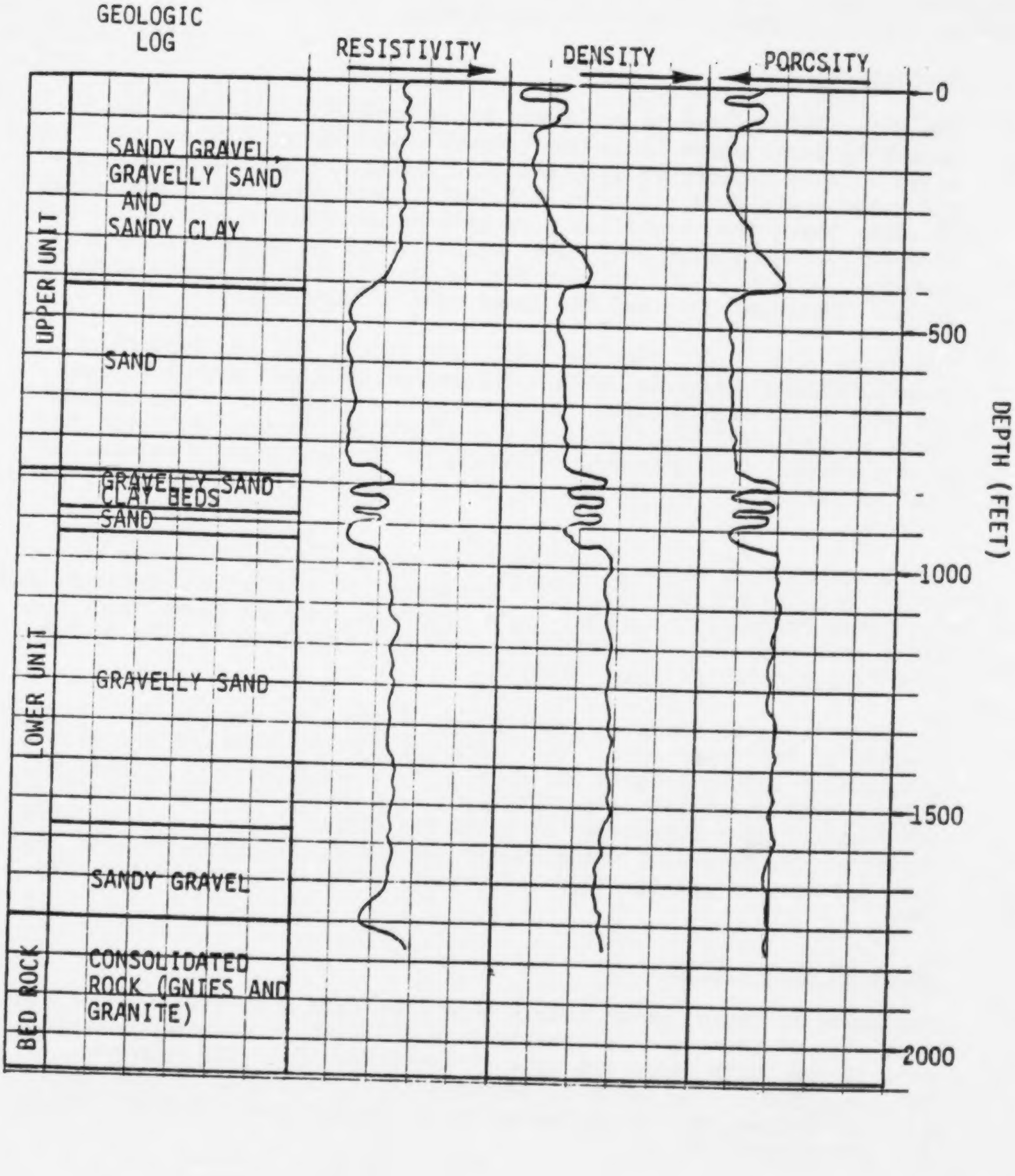

PHOENIX
SALT RIVER
1N
BUCKEYE
GILA RIVER
MERIDIAN
GILA BEND
N
T 4 S
R 1 W
10
0
10
20
30
Miles
Silt, sand, and gravel
Granite and related crystalline rocks
Mine
Dip and strike
Sand, gravel, and conglomerate
Schist
Locally includes diorite, rhyolite,
Syncline
Anticline
Proposed Mobile Hazardous Waste Facility Site

Figure 2-3: geologic log of well D030107bbb
(Wilson, 1979)



GROUND WATER

White (1963), Denis (1968 and 1975) and Wilson (1979) described the ground water conditions in the Waterman Wash Basin. In addition, the Arizona Department of Water Resources is currently compiling basic ground water data for a Hydrologic Map Series Report due for publication in early 1983. The ground water data listed below will be discussed in the following and is summarized in Table 3-1: 1.) hydrogeology, 2.) depth to ground water, 3.) ground water flow direction, 4.) aquifer characteristics, 5.) ground water use, 6.) water level decline, 7.) ground water quality and 8.) future ground water development.

Hydrogeology

The principal aquifer in the Basin is composed of basin-fill and is generally under water table conditions. Artesian conditions may exist locally because of silt and clay lenses. Even though the consolidated rocks (i.e., granite and gneiss) may yield small quantities of water where fractured (i.e., 10 gallons per minute), it is not considered a primary source of water and will not be considered in this summary. Wilson (1979) divided the basin-fill aquifer into two basic units: The upper unit and the lower unit (Figure 2-3).

The upper unit is 800 feet to 1,000 feet thick. It is composed of unconsolidated sandy clay with interbeds of sand and gravel lenses. The unit is generally higher in silt and clay content in the central parts of the Basin and higher in gravel content in the northwest part of the Basin. The saturated thickness of the unit ranges between 400 feet in the center to 700 feet in the southwest part of the basin (wilson, 1979).

The lower unit is as much as 1,000 feet thick and overlies the bedrock (i.e., granite and gneiss). It is composed of poorly to moderately consolidated coarse sandy gravel (dark gray) to sand and gravel that contains small amounts of interbedded silt and clay lenses. The entire unit is saturated (Wilson, 1979).

The facility site probably overlies the upper unit and possibly a small portion of the lower unit. It is unknown at this time whether or not groundwater exists beneath the site. The closest well is located 1¼ miles northeast of the site (C040123ca) and it is dry (moist sand) at 480 feet (Arizona Department of Water Resources, 1982). Wilson (1979) estimated the saturated thickness of the aquifer to range between less than 500 feet to greater than 1,000 feet in the area of the facility site.

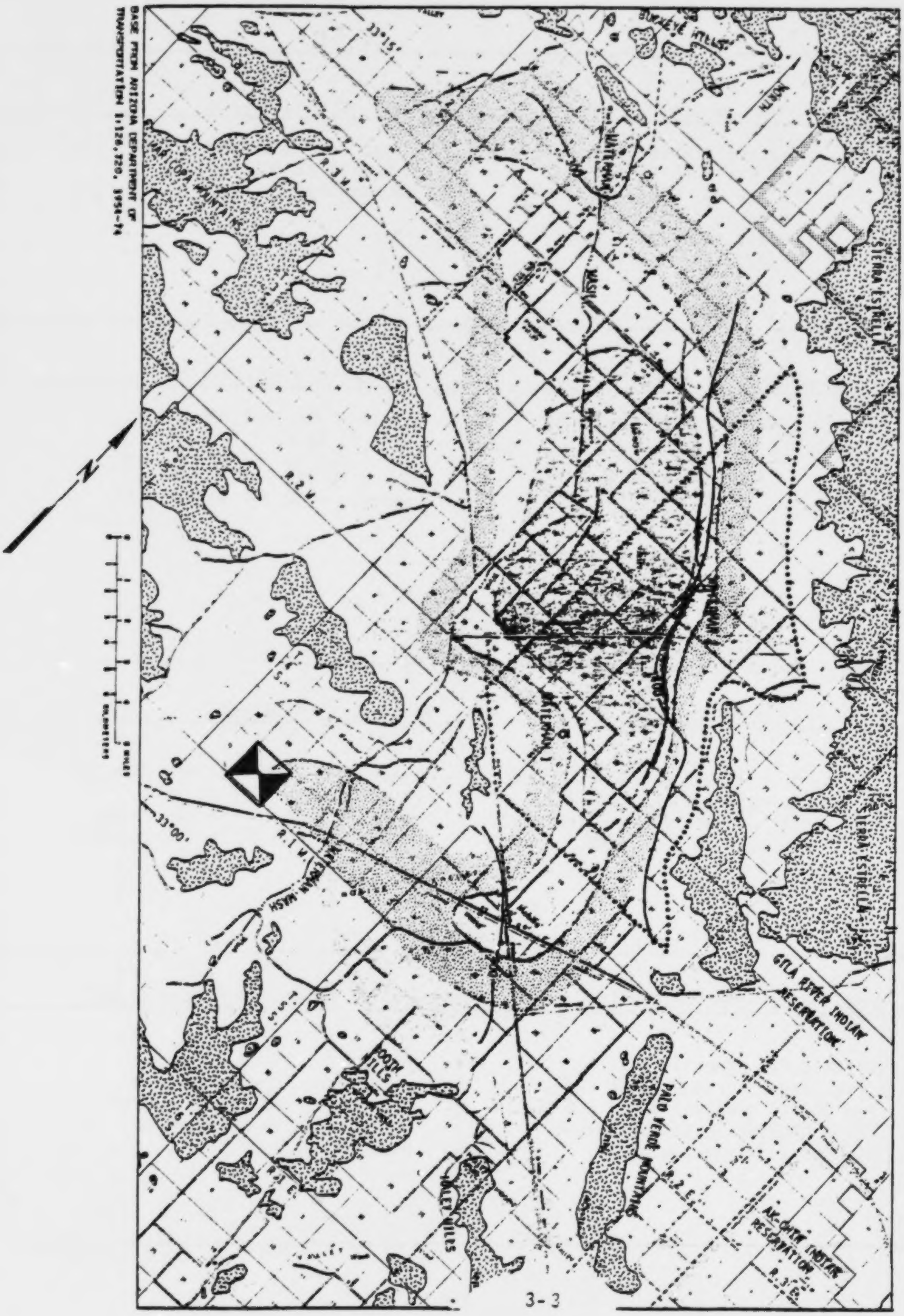
Depth to Ground Water

The depth to ground water ranges from less than 300 feet in the northwest part of the basin to greater than 400 feet in the east-central part of the basin along the base of the Sierra Estrella Mountains (Wilson, 1979). The depth to ground water in the area of the facility site is unknown, but is estimated to be greater than 500 feet (Figure 3-1 and appendix A)

Table 3-1: Summary of regional ground water data

hydrogeology	depth to ground water
aquifer is composed of Basin-fill; alluvium, unconsolidated gravel, sand, silt and clay; aquifer is under water table conditions.	ranges from 300 feet in the northwest to 400 feet in the east-central.
ground water flow direction	aquifer characteristics
flows northwest toward a cone of depression.	yield = 500 to 2,500 gal/min Sp = 15 to 74 gal/min/ft T = 5,400 to 11,000 ft^2/day θ = 8 to 20% storage = 10.3 X 10^6 acre-ft
ground water use	water level declines
primary use is agricultural; approximately 67,000 acre-ft was withdrawn from the period between 1979 to 1980.	ranges from 8 to 172 feet from a period between 1952 to 1975; the maximum is in the northwest and the minimum is in the southwest.
ground water chemical quality	future ground water development
suitable for domestic and agricultural purposes; TDS ranges from 600 to greater than 1,800 mg/l; TDS is highest in the northwest and lowest in the southeast.	no current plans for a significant ground water development; located within the Phoenix Active Management Area.

Figure 3-1: depth to groundwater and saturated thickness of aquifer. (Wilson, 1979)



BASE FROM ARIZONA DEPARTMENT OF TRANSPORTATION 1:126,720, 1954-74

33°15'
BUCKEYE HILLS
MARICOPA MOUNTAINS
SIERRA ESTRELLA
R.2 W.
R.1 W.
T.5 S.
33°00'
N
MILES
KILOMETERS
GILA RIVER INDIAN RESERVATION
BOOTH HILLS
PALO VERDE MOUNTAINS
R.1 E.
R.2 E.
R.3 E.
AK-CHIN INDIAN RESERVATION

Figure 3-1 continued

EXPLANATION

——400——	APPROXIMATE LINE OF EQUAL DEPTH TO WATER—Inter feet
	APPROXIMATE SATURATED THICKNESS OF BASIN FILL,
░	Less than 500
▒	500 to 1,000
▓	1,000 to 1,500
█	More than 1,500
□	Insufficient data
▨	CONSOLIDATED ROCKS
○	TEST HOLE
☒	Proposed Mobile Hazardous Waste Facility Site

Depth to water and saturated thickness of the basin-fill deposits in the Waterman Wash area.

Ground Water Flow Direction

The ground water in the Basin flows northwest toward a large cone of depression (approximately 50 square miles) located in the northwest part of the Basin (T 2 S ,R 2 W) (Figure 3-2). It was developed by large scale agricultural pumping (Wilson, 1979). The hydraulic gradient is 30 feet per mile within the cone of depression and 10 feet per mile in the Mobile area. The Basin is hydraulically closed to the natural outflow of ground water in the northwest part of the Basin, even though historically small quantities of ground water may have flowed northwest through the basin-fill surrounding the Buckeye Hills into the Salt River Valley Basin (White, 1963).

White (1963) speculated that a ground water divide may exist within the southeast part of the Basin called Hidden Valley. This Valley connects the Waterman Wash Basin to the Lower Santa Cruz Basin. Historically, ground water may have flowed northwest into the Waterman Wash Basin from the Lower Santa Cruz Basin (White, 1963). But because of continued pumping in the Lower Santa Cruz Basin, a ground water gradient reversal may have developed between the two Basins which would indicate that ground water may be flowing southeast out of the Waterman Wash Basin into the Lower Santa Cruz Basin (Bureau of Indian Affairs, 1981).

Aquifer Characteristics

The aquifer characteristics for the basin-fill aquifer will be discussed below and are summarized in Table 3-2: well yield, specific capacity, transmissivity and ground water storage. Wells which penetrate the basin-fill aquifer yield between 500 gallons per minute to 2,500 gallons per minute of water (White, 1963). In the northwest part of the Basin, wells usually penetrate the upper unit with only a few wells penetrating the uppermost part of the lower unit. These wells yield between 1,000 gallons per minute to 2,500 gallons per minute of water (Wilson, 1979).

The specific capacity of a test well in the central part of the Basin was determined by Wilson (1979) to range from 15 gallons per minute per foot to 74 gallons per minute per foot of drawdown for a well which is perforated in the lower unit. The upper unit was cased off because it was too fine grained to yield water readily.

The transmissivity of wells penetrating the upper unit ranged between 4,500 square feet per day to 13,000 square feet per day and averaged 8,000 square feet per day (White, 1963). The transmissivity for test wells which penetrate the lower unit in the central part of the Basin averaged 11,000 square feet per day (Wilson, 1979).

The porosity of the basin-fill aquifer ranges between 8% to 20% in the central parts of the Basin. Generally, the porosity of the upper unit is greater than the lower unit. The specific yield for the aquifer has been estimated to be 10% (considered to be low). This data has been used to determine the quantity of recoverable ground water in storage in the aquifer. In 1979 it was determined that 5.4 million acre-feet of water was in storage to a depth of 500 feet below the water table and that 4.9 million acre-feet of water was in storage to a depth range of 500 feet below the 500 foot level of the water table (Wilson, 1979).

Figure 3-2: groundwater contours (Wilson, 1979)

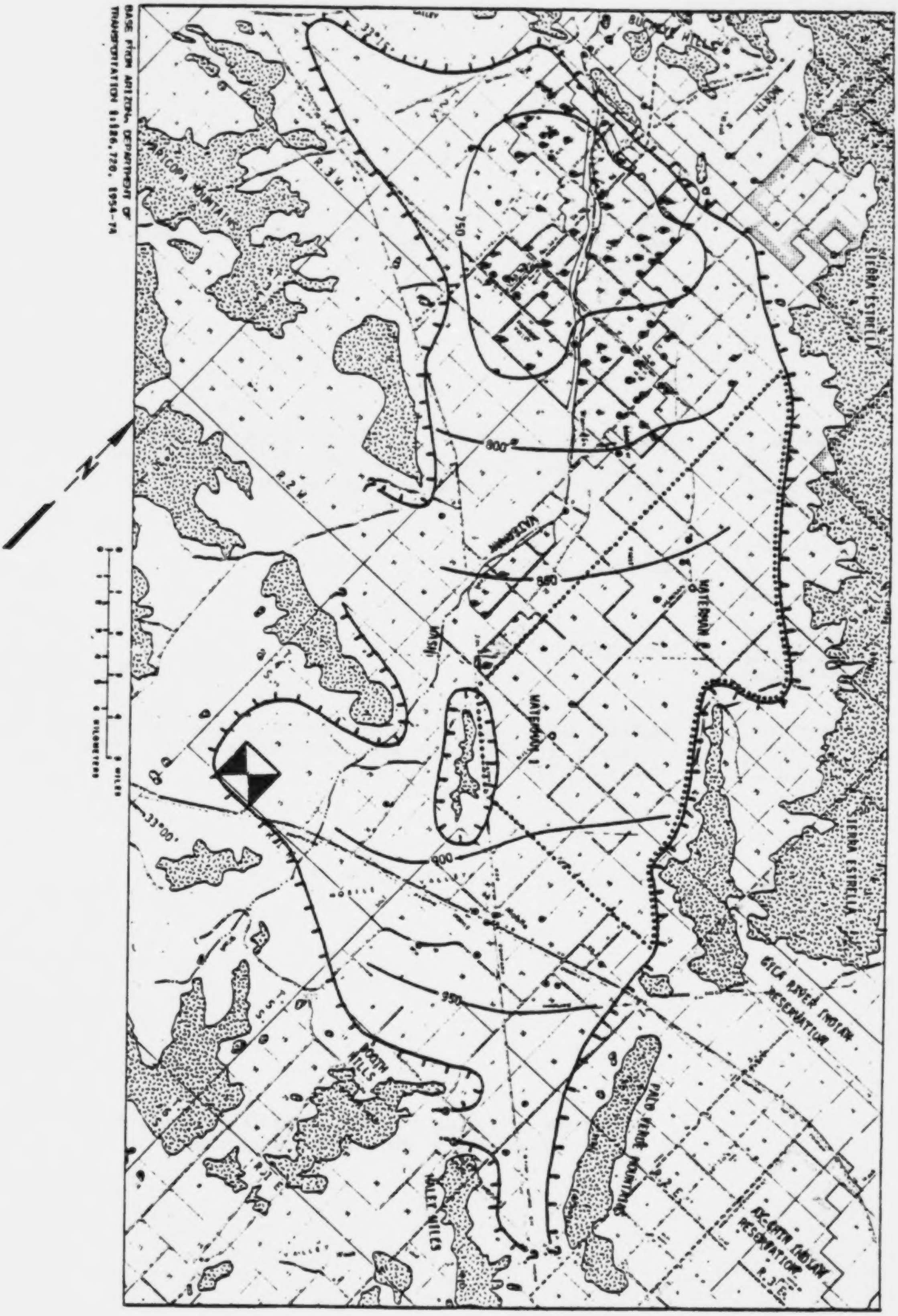

BASE FROM ARIZONA DEPARTMENT OF TRANSPORTATION 1:1,186,720, 1954-74
N
MARICOPA MOUNTAINS
BUCKEYE HILLS
SIERRA ESTRELLA
GILA RIVER INDIAN RESERVATION
PALO VERDE MOUNTAINS
AK-CHIN INDIAN RESERVATION
VALLEY HILLS
BOOTH HILLS
WATERMAN
R. 2 W.
R. 1 E.
R. 2 E.
R. 3 E.
33°00'
33°15'
750
800
850
900
950
1050
MILES
KILOMETERS

Figure 3- 2 continued

EXPLANATION

——800——	WATER-LEVEL CONTOUR—Shows approximate altitude of the water level, 1979. Contour interval 50 feet. National Geodetic Vertical Datum of 1929
●	WELL
○	TEST HOLE
	APPROXIMATE BOUNDARY OF AREA IN WHICH POTENTIAL WELL YIELD IS MORE THAN 500 GALLONS PER MINUTE FROM PROPERLY CONSTRUCTED WELLS—Queried where uncertain
☐	BASIN-FILL DEPOSITS
▨	CONSOLIDATED ROCKS
▒	IRRIGATED AREA AS OF 1974—Land under cultivation or that prepared for cultivation was considered irrigated. From Denis (1975)
⧗	Proposed Mobile Hazardous Waste Facility Site

--Altitude of the water level, potential well yield, and irrigated area in the Waterman Wash area.

Table 3-2: Regional aquifer characteristics

aquifer characteristics	
1. Well yield from basin-fill aquifer	1.a. 500 to 2,500 gal/min 1.b. 1,000 to 2,500 gal/min in the northwest basin and penetrating the upper unit
2. Specific Capacity (Sp)	2.a. 15 to 74 gal/min/ft of drawdown in the central basin and penetrating the lower unit
3. Transmissivity (T)	3.a. averaged 8,000 ft^3/day 3.b. 4,500 to 13,000 ft^2/day for wells penetrating the upper unit 3.c. averaged 11,000 ft^2/day in the central basin and penetrating the lower unit
4. Porosity (θ)	4.a. 8 to 20% in the central basin 4.b. porosity greater in the upper unit compared to the lower unit
5. Specific yield (Sy)	5.a. 10% (considered low)
6. Ground water storage	6.a. 5.4×10^6 acre-feet to a depth of 500 feet below the water table 6.b. 4.9×10^6 acre-feet to a depth of 500 feet below the depth of 500 feet below the water water table 6.c. total of 10.3×10^6 acre-feet for 1000 feet of aquifer

Ground Water Use

The only source of drinking water in this Basin is ground water. The primary use of the ground water is for agricultural purposes (Denis, 1975). The total ground water pumpage for the period between 1979 to 1980 has increased 19% to 67,000 acre-feet compared to the 1978 to 1979 period (U.S.G.S., 1981). But it is still a decrease from the 1977 to 1978 peak of 72,000 acre-feet. This may be the beginning of a trend to decrease ground water pumpage (Table 3-3).

The northwest and central parts of the Basin are the primary areas for ground water withdrawal. Within these two areas there are at least 80 wells located within approximately 120 square miles (.7 wells per square mile) (appendix B). The primary use of these wells is for agricultural purposes (Arizona Water Commission, 1978). In addition, these two areas contain all of the irrigated land (as of 1973) within the Basin (Wilson, 1979). Thus, it would be reasonable to assume that the greatest withdrawal of ground water occurs in these two areas of the Basin.

The southwest part of the Basin is less developed than the other two parts. There are approximately 12 wells located within 75 square miles (.2 wells per square mile). The use of the wells is divided equally between domestic and agricultural purposes (Arizona Water Commission, 1979).

Water Level Declines

Water level declines are occurring within the Basin because of the approximate overdraft of 38,000 acre-feet per year (Arizona Water Commission, 1978). The water level declines have ranged between 8 feet to 172 feet for a period between 1952 to 1975 (Figure 3-3). The maximum water level declines have occurred in the northwest part of the Basin (T 2 S, R 2 W, Section 9). The minimum water level declines have occurred in the southwest part of the Basin near Mobile (T 4S ,R 1E, Section 28) (Denis, 1975) (appendix C).

Ground Water Chemical Quality

The ground water chemical quality has been studied by Wilson (1979), U. S. Army Corp of Engineers (1979) and Denis (1968 and 1975). Denis (1968) presented chemical analyses (i.e., major cations and anions) of wells located in the northwest part of the Basin (Figure 3-4, Figure 3-5 and appendix D). Denis (1968 and 1975) and Wilson (1979) concluded that the ground water is acceptable for irrigation purposes even though the water has a high to very high sodium and salinity hazard. The total dissolved solids concentration ranges between less than 600 mg/l to greater than 1,800 mg./l. In addition, the total dissolved solids concentrations are highest in the northwest part of the Basin and lowest in the southeast part of the Basin. Many of the wells produce water which exceeds the maximum contaminant level for fluoride and nitrate in drinking water in the northwest part of the Basin. There is only a limited number of wells with long-term chemical quality analyses available in the Basin. The U.S. Army Corps of Engineers (1979) has determined from this data that no substantial salinity changes have occurred in the northwest part of the Basin.

Table 3-3: estimated ground water pumpage (U.S. Geological Survey, 1981)

Date (year)	Ground water pumpage (10^3acre-feet)
1965	45
1966	45
1967	52
1968	54
1969	60
1970	55
1971	55
1972	57
1973	55
1974	69
1975	64
1976	70
1977	72
1978	54
1979	67

Figure 3-3: ground water level decline (Arizona Dept. of Water Resources, 1982)

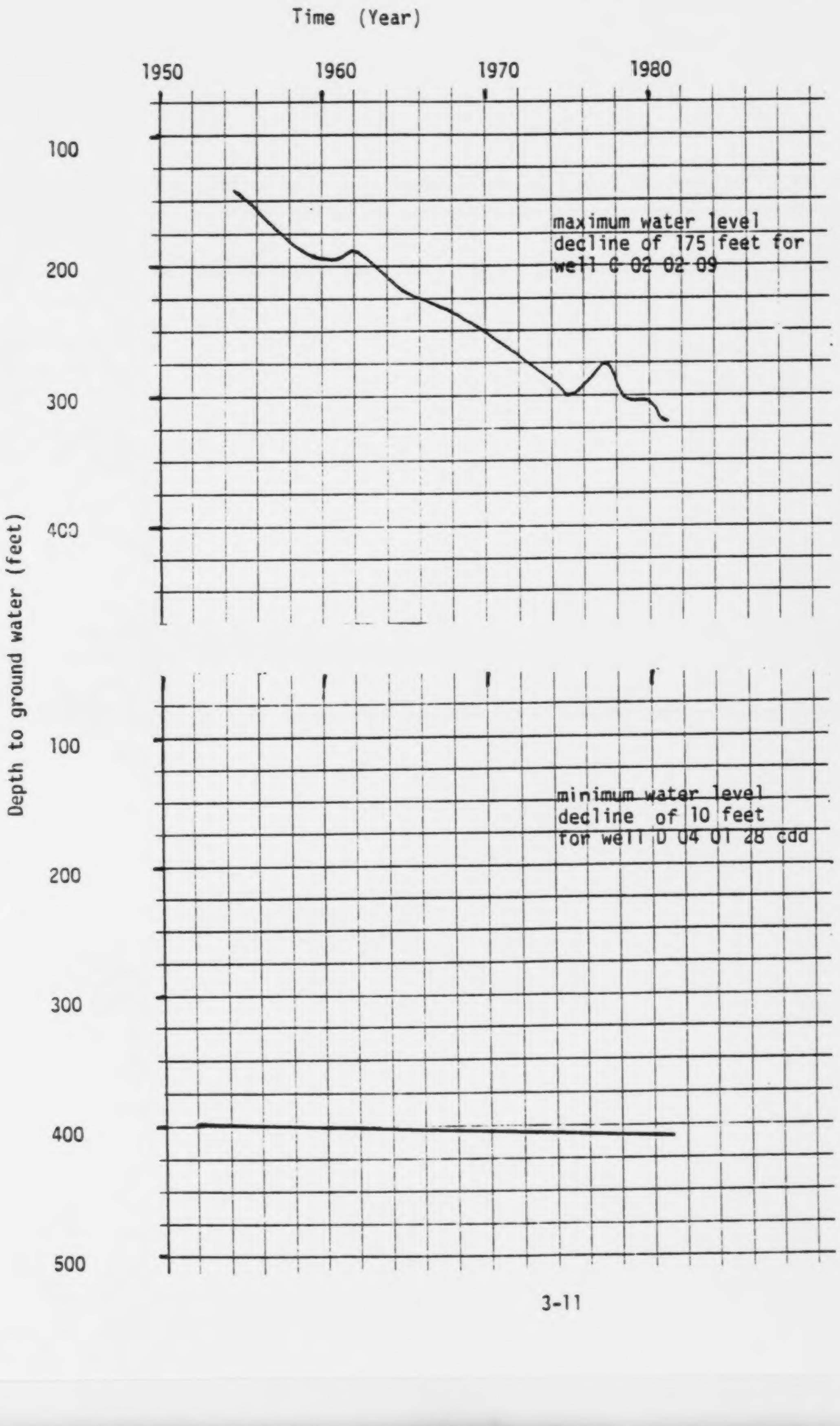
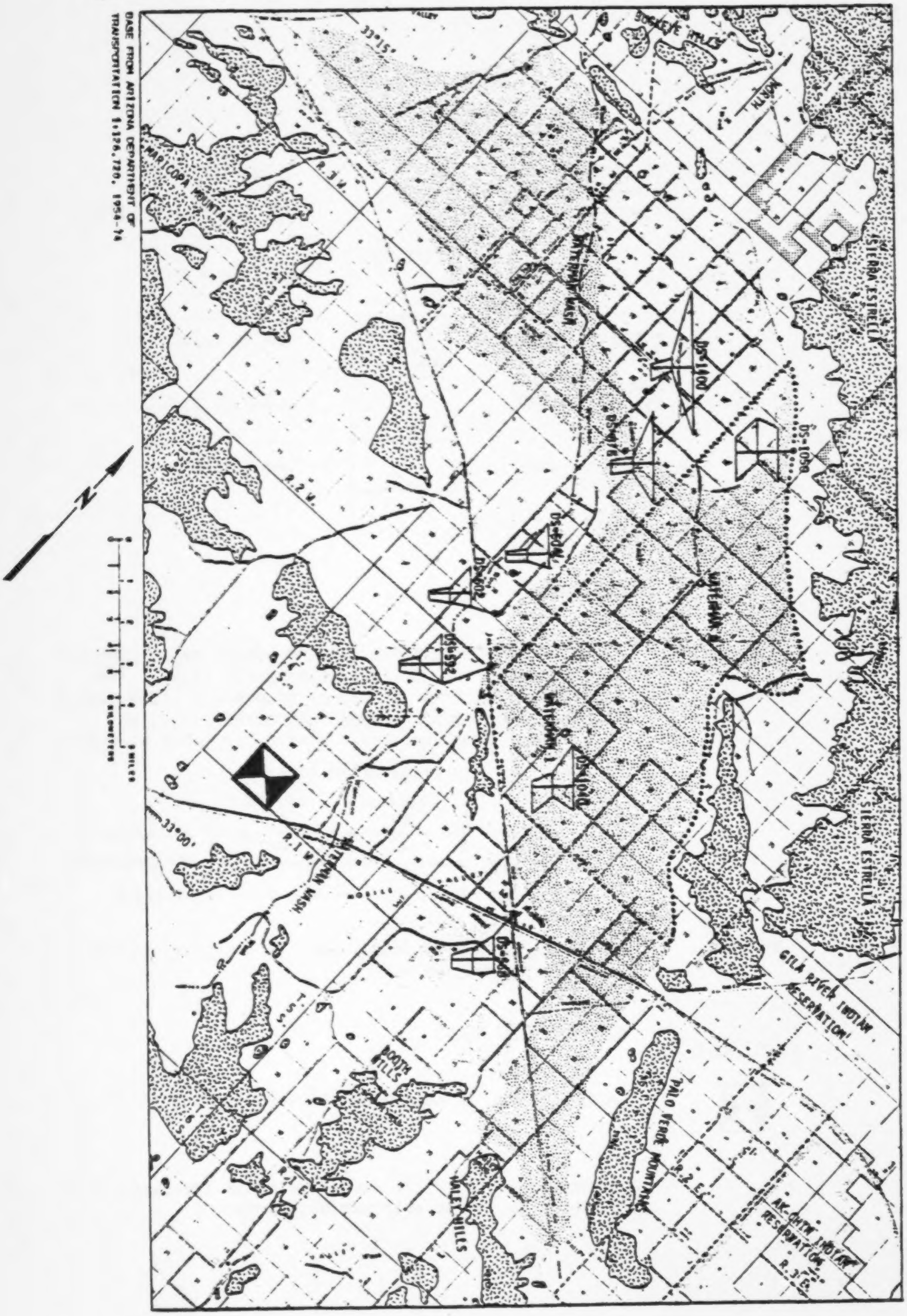


Figure 3-4: groundwater chemical quality (Wilson, 1979)



BASE FROM ARIZONA DEPARTMENT OF TRANSPORTATION 1:126,720, 1954-76

SIERRA ESTRELLA
BUCKEYE HILLS
NORTH
33°15'
R.3W.
R.2W.
R.1W.
R.1E.
R.2E.
R.3E.
33°00'
T.5S.
MARICOPA MOUNTAINS
WATERMAN WASH
DS-1000
GILA RIVER INDIAN RESERVATION
PALO VERDE MOUNTAINS
AK-CHIN INDIAN RESERVATION
BOOTH HILLS
N
MILES
KILOMETERS

Figure 3-4 continued

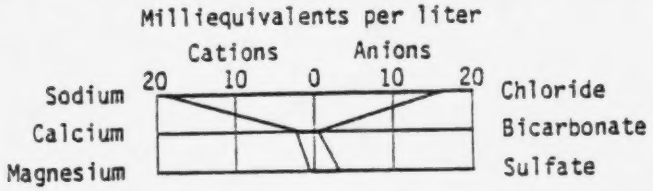
EXPLANATION

SPECIFIC CONDUCTANCE, IN MICROMHOS PER CENTIMETER AT 25°C		DISSOLVED SOLIDS (CALCULATED), IN MILLIGRAMS PER LITER
Less than 1,000	░	Less than 600
1,000 to 2,000	▓	600 to 1,200
2,000 to 3,500	▒	1,200 to 2,100
Insufficient data	□	Insufficient data

● WELL

○ TEST HOLE

CHEMICAL-QUALITY PATTERN DIAGRAM—Shows major chemical constituents in milliequivalents per liter. The patterns are in a variety of shapes and sizes, which provides a means of comparing, correlating, and characterizing similar or dissimilar types of water


Milliequivalents per liter
Cations
Anions
20
10
0
10
20
Sodium
Calcium
Magnesium
Chloride
Bicarbonate
Sulfate

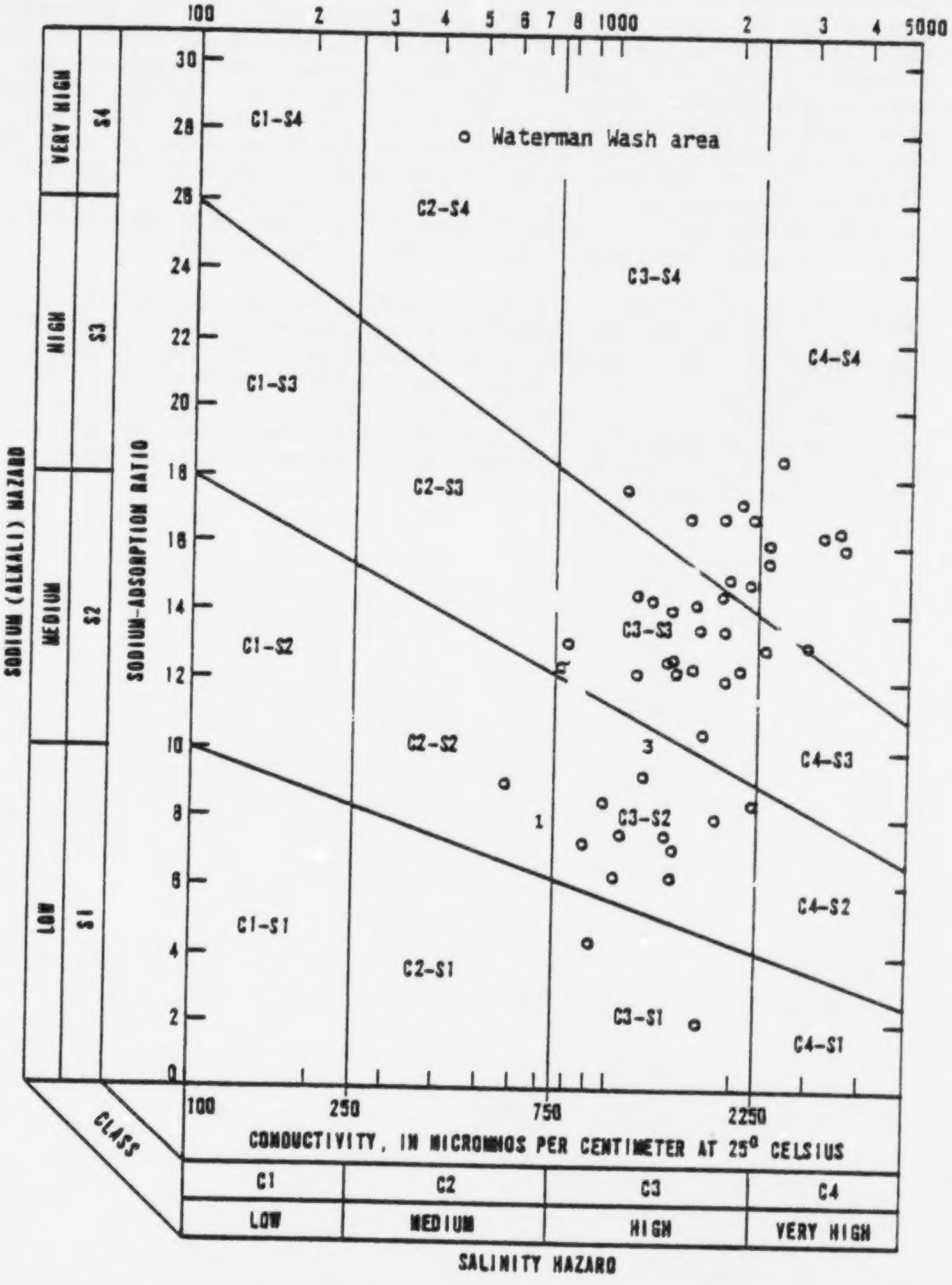
DS=1050 DISSOLVED SOLIDS—Number, 1050, is dissolved solids in milligrams per liter

▨ CONSOLIDATED ROCKS

⧗ Proposed Mobile Hazardous Waste Facility Site

--Chemical quality of the ground water in the basin-fill deposits in the Waterman Wash area.

Figure 3-5: Sodium and Salinity hazard of water (Wilson, 1979)



Sodium and salinity hazard of water. Diagram adapted from U.S. Salinity Laboratory Staff

Future Ground Water Development

Currently there has been only one major ground water development considered for the Basin, the AK Chin Water Supply Project. The Waterman Wash Basin site has been chosen through an EIS evalatuion as one of two alternative sites with Vekol Valley Basin as the primary site for the water supply project (Bureau of Indian Affairs, 1981). If the Waterman Wash Basin had been chosen as the primary site (located in the central part of the Basin), it would have produced 85,000 acre-feet per year for 25 years from the aquifer, it would have more than doubled the present overdraft of ground water from the Basin. In addition, water level declines of 200 feet and hydraulic gradient changes would have occurred if this area was developed (Bureau of Indian Affairs, 1981).

Since this Basin is within the Phoenix Active Management Area as defined by the Arizona Department of Water Resources (1981), there is a restriction on increasing ground water withdrawals for agricultural use. In addition, as ground water levels continue to decline, it may become prohibitive to pump the ground water. The result would be a reduction of the quantity of ground water withdrawn. But, industrial use permits can be obtained to withdraw ground water as long as there is at least a 50-year supply.

SURFACE WATER

The streams in the Waterman Wash Basin are ephemeral, surface water flowing only in response to locally intense short duration precipitation events (i.e., thunder storms) during the summer season and only after persistant steady rain in the winter. Even though the average annual precipitation is in the range of 7.49 inches, during an individual event the monthly or annual precipitation may be exceeded.

The U. S. Geological Survey (1982) has a streamflow guaging station on Waterman Wash near Buckeye (Long. 112°30' 33", Lat. 33°19' 49"). The peak streamflow for each year from the period between 1964 to 1980 is listed in Table 4-1. The maximum recorded peak streamflow was 6,300 cubic feet per second in 1967 with an average peak of 1,608 cubic feet per second for the 1964 to 1980 period. These streamflows are characterized as "flash floods".

The Bureau of Indian Affairs (1981) has divided the watershed in the Basin into three regions: mountain slope, bajada and desert plain. The stream channels in the mountain slope region generally have steep gradients with small well defined channels. In the bajada region the stream channels generally have flatter gradients with less defined channels. The stream channels in the desert plain region are generally very flat with narrow shallow channels. Much of the surface waterflow is sheetflow in the desert plain region.

The facility site is located in a 18.4 square mile watershed characterized as a desert plain region (Figure 4-1). The watershed also contains mountain slopes and bajada regions. The stream channels in the desert plain have a flat gradient (40 feet/mile) with narrow shallow sandy channels. The watershed drains into the West Prong Waterman Wash which goes into Waterman Wash. The peak discharge for a 100-year, two hour precipitation event for this watershed has been estimated by the SCS method to be 4,000 cubic feet per second (Arizona Department of Transportation, 1968) (Appendix E).

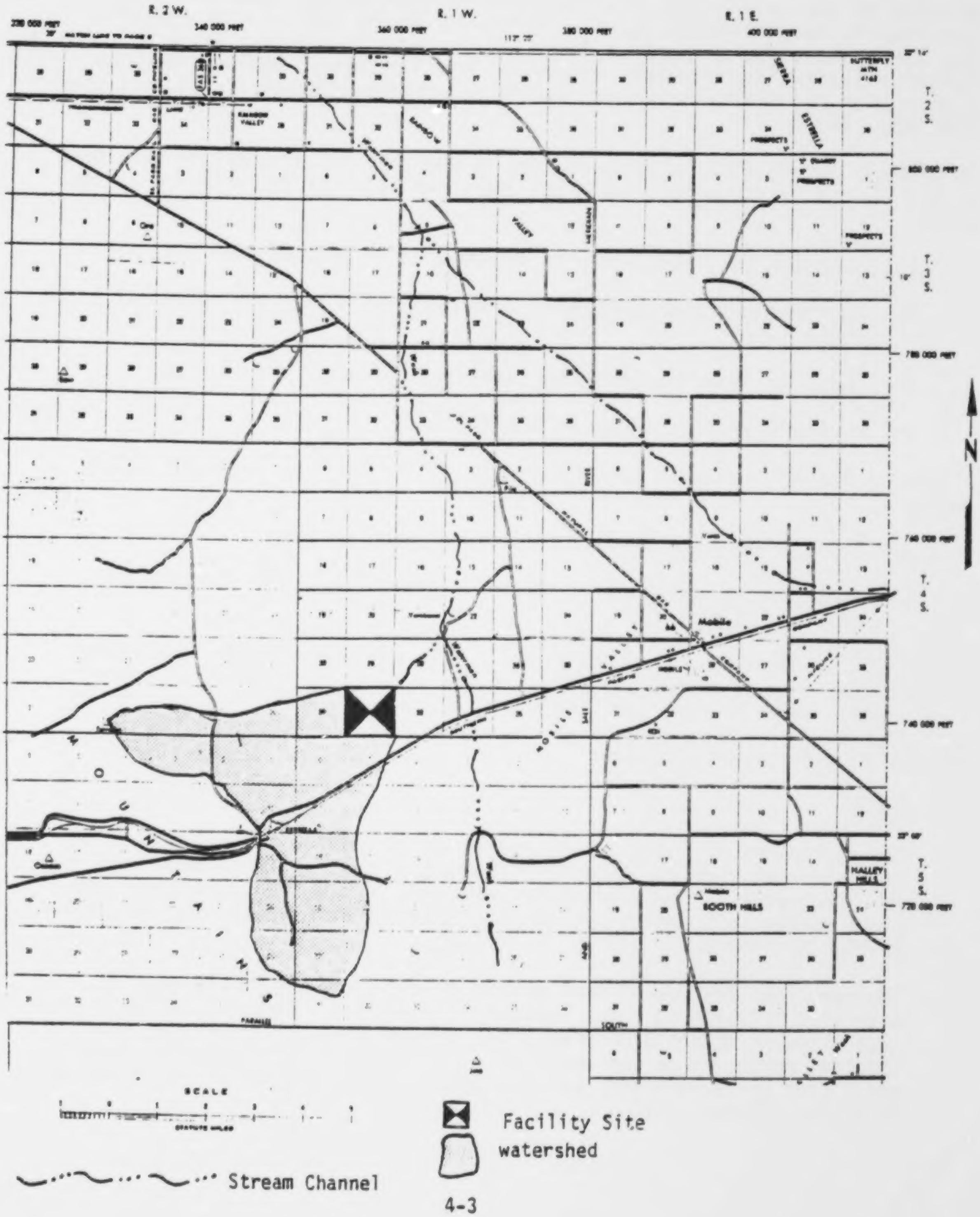
The primary use of the surface water is for livestock drinking water. The surface water is collected in stock ponds (i.e., detention basins). There are no known stock ponds within the facility site watershed. But there are at least four stock ponds or diversiton downstream from the watershed.

Table 4-1: streamflow records for Waterman Wash near Buckeye, USGS station #09514200 (drainage area = 403 mi^2)*
(U.S. Geological Survey, 1978)

Date (month-year)	Peak discharge (ft^3/s)
9-64	2680
7-65	1200
9-66	5560
9-67	6300
12-68	560
8-69	400
8-69	1600
9-70	700
8-71	2080
3-72	2000
73	no flow
9-74	100
10-75	1200
9-76	1180
10-77	40
8-78	1150

*the station is a peak flow crest stage guage

Figure 4-1: Proposed Mobile Hazardous Waste Facility Site Watershed


R. 2 W.
R. 1 W.
R. 1 E.
340 000 FEET
360 000 FEET
380 000 FEET
400 000 FEET
T. 2 S.
T. 3 S.
T. 4 S.
T. 5 S.
800 000 FEET
780 000 FEET
760 000 FEET
740 000 FEET
720 000 FEET
N
Mobile
BOOTH HILLS
MALLEY HILLS
SCALE
STATUTE MILES
Facility Site
watershed
Stream Channel

DISCUSSION AND CONCLUSIONS

In this section a discussion of general conclusions concerning the data and the adequacy of the facility as a hazardous waste disposal site are presented first, followed by a specific discussion concerning each section (i.e. soils, geology, ground water and surface water). It must be emphasized that a majority of the conclusions have been derived from regional data compiled from reports describing the Basin. There is a severe lack of site specific data to substantiate conclusions which will be used to obtain a State and/or federal hazardous waste permit, therefore, the conclusions made can only be used to plan for future data needs and to compare the suitability of this site with other sites.

In general, the facility site appears to be adequate for disposal of hazardous waste. A list of the major beneficial characteristics of the site are listed below:

1) The depth to ground water is inferred to be greater than 470 feet;

2) The Phoenix Active Management Area will limit the development of ground water;

3) There has been no documented subsidence or earth cracks; and

4) There are no documented active faults.

A list of the major adverse characteristics of the facility site are listed below:

1) Flood prone areas are located within the site; and

2) There are no thick and/or extensive clay beds within 150 feet of the land surface.

All of the above adverse characteristics can be modified through site design and preparation. As an example, flood protection can be constructed to control surface water runoff, and liners and leachate collection systems can be constructed to eliminate seepage of liquid waste. A specific discussion of each section is presented below:

Soils

The shallow (6 feet deep) soil properties defined at the facility site indicate that they are moderately permeable, have a high storage capacity and a moderate to low attenuation capacity. There are no physical barriers in the soils which can substantially reduce or eliminate the infiltration of liquids.

The deep (150 feet deep) soil properties indicate a dry fine-grained material, but with no thick, extensive clay beds. Textural analyses indicate a low to moderate permeability. Deeper soils (i.e. greater than 150 feet deep) may be coarser since, as a general rule, alluvial deposits grade from coarse-grained near mountains to fine-grained along the center of basins. (Brown, 1976).

Geology

The geologic data for the facility site indicates that the primary geologic hazard is the potential of differential land subsidence and associated earth cracks. This is because the facility site is located near a mountain front where subsidence is most likely to occur. The potential for future subsidence in the immediate facility site area appears to be low because of (1) minimum ground water level declines (ie.e 10 feet) and (2) the lack of extensive clay/silt deposits discovered in the Basin.

In addition, even though subsidence and earth cracks have occurred in adjacent ground water basins (i.e. Lower Santa Curz and Salt River) (Laney, 1978), no subsidence and/or earthcracks have been reported in the Waterman Wash Basin, even in the area of maximum ground water level decline.

Ground Water

The ground water data for the Basin indicates that the basin-fill aquifer is capable of yielding large quantites of water which are generally suitable for domestic and agricultural purposes. In addition, it is the only water supply for the Basin. Future ground water development should be limited to domestic and industrial use only because the Basin is located within the Phoenix Active Management Area. The aquifer characteristics beneath the facility site have not been assessed because of a lack of wells in the vicinity of the site. However, the site does meet the State ground water standards since the depth to ground water is greater than 150 feet (i.e. data from soil borings). In addition, a well located 2.2 miles northeast of the site was dry at 470 feet in 1982. Therefore it can be assumed that the depth to ground water beneath the facility site is at least 470 feet.

Surface Water

The surface water data indicates that stream flow occurs seasonally in response to rainfall and that a potential flood hazard exists at the facility site. The larger streams in the Basin (i.e. Waterman Wash) contribute limited recharge to the aquifer. Use of the water is limited to ponds for livestock.

RECOMMENDATIONS

Because the data compiled to date for the facility site is general in nature and becuase site specific data is required to obtain a hazardous waste permit, it is recommended that site specific data be collected. The data collected would be used to further assess the potential for ground and surface water contamination, and for the design and construction of protection and monitoring devices at the facility. The following data requirements are not conclusive and should be implemented in connection with a guidance document currently being prepared by the Bureau of Waste Control for ground water and vadose zone monitoring requirements.

Soils

Additional site specific data is required before designing the facility. This data would include physical and chemical soil properties which can be used to assess the permeability, storage capacity and attenuation ability of the soil (Table 6-1, 6-4). This can be accomplished by conducting an intense soil survey of the facility site. In addition, deep soil (vadose zone) borings need to be drilled in conjunction with a vadose zone monitoring program. Artificial liners should be installed to prevent seepage. Clay liners should be excluded because of climatic conditions. Vadose zone monitoring would include resistivity array, lysimeters and neutron probes.

Geology

Additional site specific data would include monitoring factors associated with land subsidence. This can be accomplished by measuring ground water level declines and land subsidence, determining bedrock contours, and defining geologic material and structures in the vadose zone and the aquifer. This would require drilling to bedrock and performing a geophysical study (Table 6-4).

Ground Water

Additional site specific data would include obtaining aquifer characteristics. This data would be used to define ground water flow direction, flow rate, storage capacity, chemical quality and attenuation ability (Tables 6-2, 6-4). This can be accomplished by conducting geophysical surveys, installing monitoring wells and piezometers and conducting aquifer tests.

Surface Water

Additional data would include defining the watershed characteristics and climatic conditions which are related to quantity of runoff and erosion (Tables 6-3,6-4). This can be accomplished by installing streamflow gauging stations, defining soil properties, installing weather instruments and eventual computer modeling of the watershed to predict runoff. In addition, flood protection should be installed to control runoff from entering or leaving the site.

Table 6-1: physical and chemical soil properties (Fuller, 1978)

Physical	Chemical
Texture Permeability Cementation surface area porosity bulk density moisture content thickness	hydrous oxide (Fe) pH cation-exchange capacity

Table 6-2: aquifer characteristics

Physical	Chemical
transmissivity permeability gradient geologic material anisotropy porosity texture thickness vertical head distribution	chemical quality

Table 6-3: watershed characteristics

Watershed characteristics	Climatic conditions
soil characteristics vegetation type/density slope moisture content permeability stream channel characteristics streamflow sediment/erosion chemical quality of runoff chemical quality of sediment	evaporation wind direction solar energy temperature humidity precipitation

TABLE 6-4: Methods to collect data and protect site

SOILS	GEOLOGY	GROUND WATER	SURFACE WASTE
artificial liners resistivity matrix shallow soil borings lysimeters neutron probes leachate collectors aerial photos bore holes	bore holes geophysics tensiometers surveying geologic log	monitoring wells piezometers geophysical logs aquifer tests modeling	stream flow gauges weather instruments modeling dikes detention ponds

APPENDIX G

AIR QUALITY

AMBIENT AIR QUALITY STANDARDS

The Clean Air Act Amendments of 1970 mandated that the EPA Administrator publish national primary and secondary ambient air quality standards for each air pollutant for which an air quality criterion exists. Primary and secondary air quality standards are those required to protect the public health and welfare respectively from any known or anticipated effects of a pollutant. The Arizona and National Ambient Air Quality Standards (NAAQS) are summarized in Table G-1. They are also listed in Title 40, Part 50, of the Code of Federal Regulations, Protection of Environment.

EPA AIR QUALITY REGULATIONS

Prevention of Significant Deterioration

The Clean Air Act Amendments of 1977 introduced the concept of Prevention of Significant Deterioration (PSD) which addresses industrial growth. In each state, Air Quality Control Regions in which the air quality was better than the NAAQS were classified as attainment areas and construction of new sources fell under PSD regulations. Those areas where the air quality was worse were classified as non-attainment. Growth in attainment areas is permitted only while the pollutant concentrations stay below a specific level, whereas growth in non-attainment areas can only occur if appropriate offsets are used. It should be noted that only certain types of sources are subject to PSD regulations.

All parts of the country are considered either Class I, Class II, or Class III for PSD purposes. Class II applies to areas where moderate, well controlled and sited industrial growth would be permitted; Class I applies to areas (primarily national parks and monuments) where practically any deterioration in air quality would be significant; and Class III applies where individual areas would be allowed to experience the greatest degree of air quality deterioration. The proposed site and the two alternate sites and their environs are Class II Areas.

In order to be subject to PSD review, a new source must have a potential to emit at least 250 tons/year of any pollutant regulated by the EPA. Volatile organic compounds (VOC), an ozone

TABLE G-1. AMBIENT AIR QUALITY STANDARDS[*]

Pollutant	State and Federal AAQS[†] Primary[#]	State and Federal AAQS[†] Secondary[**]	PSD Increments Class I	PSD Increments Class II	PSD Increments Class III
Carbon Monoxide:					
1-hour	40	40	--	--	--
8-hour	10	10	--	--	--
Hydrocarbons:					
3-hour (6-9 a.m.)	160	160	--	--	--
Lead:					
Calendar Quarter	1.5	1.5	--	--	--
Nitrogen Dioxide:					
AAM[#]	100	100	--	--	--
Ozone:					
1-hour (daily max.)	0.12	0.12	--	--	--
Particulates					
24-hour	260	150	10	37	75
AGM[##]	75	60	5	19	37
Sulfur Dioxide:					
3-hour	--	1,300	25	512	700
24-hour	365	--	5	91	182
AAM	80	--	2	20	40

[*] Source: Reference 1. Units are ug/m^3 except for carbon monoxide and ozone, which are in units of mg/m^3 and ppm, respectively.

[†] Standards:

Not to be exceeded more than once per year, except:

- In the case of ozone, the number of exceedance days is not to be more than 1 per year based on a 3-year running average.
- In the case of lead, never to be exceeded.

[#] Level necessary to protect the public health.

[**] Level necessary to protect the public welfare.

[††] Annual Arithmetic Mean.

[##] Annual Geometric Mean.

precursor, emitted at a rate greater than 250 tons/year could be subject to PSD review.

If the facility is determined to be a major source, it will be subject to PSD review for other criteria or non-criteria pollutants emitted in quantities greater than a significant level (Table G-2). These determinations are expected to be made in the permitting phase.

National Emission Standards for Hazardous Air Pollutants (NESHAP)

EPA designates and sets emission standards for "hazardous air pollutants;" to date, seven compounds have been designated as NESHAP pollutants (asbestos, benzene, mercury, vinyl chloride, beryllium, arsenic, and radionuclides). The only emission standard promulgated under these regulations which might apply to the proposed facility is that for asbestos, which specifies that there shall be "no visible emissions" from waste disposal sites (40 CFR, Part 61.25). There are no other emission standards under NESHAP which would force the facility to control emissions of hazardous compounds to the air.

MODELS AND INPUTS

Model

The VALLEY model contains a bivariate Gaussian algorithm applicable to both level and complex terrain (2). Calculations are made in 22.5 degree sectors from the source. The terrain treatment is made in a simplified manner, and thus the model is only applicable to first-order estimates of pollutant concentrations. The model can be run in a rural-mode for either flat or complex terrain. The rural-mode with terrain variations was used in this study.

Under contract to EPA, Aerocomp determined that maximum concentrations obtained from the screening mode related best to the second highest 24-hour concentration produced by more refined models, such as MPTER. Also, the highest and second highest concentrations calculated by VALLEY have been shown to correlate well with monitored values in regimes similar to those considered here.

The VALLEY model assumes sources which emit nonreactive gases or particulates with negligible deposition. Both of these factors are considered important in this application; and in a more rigorous mode, they should be considered. However, given the screening nature of this analysis, a certain degree of conservatism was allowed. Thus, by assuming no deposition of particulates, conservative estimates of TSP are expected. Similarly, neglecting reactivity of organic compounds is expected to yield conservative results.

TABLE G-2. SIGNIFICANT LEVELS OF AIR POLLUTANTS (PSD)

Pollutant	Level (tons/yr)	Pollutant	Level (tons/yr)
VOC	40	Mercury	0.1
NO_x	40	Vinyl Chloride	1.0
Sulfur Dioxide	40	Fluorides	3.0
TSP	25	Sulfuric Acid Mist	7.0
Lead	0.6	Hydrogen Sulfide	10
Asbestos	0.007	Total Reduced Sulfur	10
Beryllium	0.0004	Reduced Sulfur Compounds	10

The treatment of the pollutant plume is dependent on the input of two parameters to the VALLEY model: terrain and stability. In the stable case, the plume height remains parallel to the horizontal direction until the plume comes into contact with terrain that is greater than or equal to the plume height. Beyond this point, the center of the plume remains 10 meters above the terrain. Also, beyond this point, deflection of the plume is simulated by an attenuation factor which decreases linearly from 100 percent at initial plume height to 0 percent 400 meters higher. Concentrations calculated under stable condition are valid only at receptors on the windward side of sloping terrain. In the unstable or neutral case, the plume remains parallel to the terrain. Because of this, the unstable/neutral case may cause underpredictions in complex terrain.

The model can calculate dispersion from area or point sources. An area source is treated as a virtual point source, which is located upwind of the actual source. Receptors are only affected by a fraction of the area source at any given time, dependent upon the fraction of the area source that falls within a 22.5-degree sector upwind from the receptor. Sensitivity tests have shown that spurious concentrations are calculated by VALLEY between the virtual point source and the actual area source for large sources and multiple wind directions. For this reason, the short-term mode was run for one wind sector at a time.

Meteorological Inputs

The VALLEY model was activated in the long-term and short-term (screening) modes. The screening mode allows the user to look at worst-case impact by choosing worst-case meteorology formatted as a STability ARray (STAR) deck. The long-term mode calculates annual average pollutant concentrations using a STAR deck generated from hourly observations at the Phoenix airport from 1955 to 1964.

In this study, the maximum short-term impacts on the sites of concern were determined using the following meteorological condition:

- Stability Class F.
- Winds directed from the sources toward sensitive receptors.
- Light winds (2.5 m/s).

As noted earlier, the long-term simulation used STAR meteorology at the Phoenix Sky Harbor International Airport from 1955 to 1964. While the Estrella site has meteorological data available for 3 years, the data format is not readily usable in VALLEY. Moreover, the cost of obtaining the data was beyond the budget of the project. If a more detailed analysis is undertaken, it is recommended that the more representative Estrella meteorological data be used.

Other meteorological inputs required for both the screening and long-term modes were obtained from the Local Climatological Data for Phoenix. Average temperature and pressure values were used in VALLEY to normalize the concentrations to standard temperature and pressure.

EMISSION CALCULATIONS - TSP

Particulate Emissions: Construction

Those factors considered to be the primary source of particulates during construction are:

- o Unpaved access roads combined with heavy traffic.
- o Site excavation.
- o Soil disturbance and subsequent wind erosion.

Emission estimates were made for these three sources of particulates.

Particulate Emissions from Access Roads--

The following equation was used to calculate the emission factor (EF) for vehicles on unpaved roads (3):

$$EF = (0.6)(0.81s)(S/30)(1-W/365)$$

where:

EF = emission factor (lb/VMT);

s = silt content (%)
= 15% (4);

S = average vehicle speed (mph)
= 30 mph (assumed);

W = mean annual number of days with greater than 0.01 inches of precipitation

= 30 days (5).

The above resulted in an emission factor of 6.7 lb/VMT (3039.1 g/VMT) for unpaved roads.

The following assumptions were made to determine the emission rate from the access road:

- Fifty employees during the construction period (6).
- One employee per vehicle.
- Ten service/delivery trucks per day.
- All traffic occurs within a 30-minute period.

The last three assumptions are conservative (worst case) estimates. The resulting emission rate (Q) was computed from the unpaved road emission factor (EF) and the traffic volume (TV) as follows:

$$Q = \frac{EF\ (g/VMT)\ TV\ (vehicles/hr)}{1609.3\ (m/mi)\ 3600\ (sec/hr)}$$

$$= \frac{((3039.1)\ (120)}{(1609.3)\ (3600)}$$

$$Q = 0.063\ g/m\text{-}sec.$$

Particulate Emissions Resulting from Excavation at the Construction Site--

A truck and shovel operation was the assumed method of site excavation. The emission factor for such an operation is 0.037 lb/ton (3). Assuming that 1 yd^3 of overburden is equivalent to 1.3 tons (4), the emission factor then becomes 0.048 lb/yd^3. Using the design specifications of the facility, the volume of excavated material was determined to be approximately 907,000 yd^3, resulting in total annual particulate emissions (Q) of 21.77 tons:

$$Q = \left(\frac{0.048\ lb}{yd^3}\right)\ (907{,}000\ yd^3)\ \left(\frac{ton}{2{,}000\ lb}\right) = 21.77\ tons/year$$

Particulate Emissions Resulting from Wind Erosion of Disturbed Areas--

To determine the emission factor for wind erosion of disturbed areas, an equation used to calculate soil losses from agricultural tilling was employed:

$$EF = 0.01\ a\ I\ K\ C\ L\ V \qquad (3)$$

where:

EF = emission factor (tons/acre-year);

a = portion of total wind erosion losses that would be measured as suspended particulates

= 0.01 (4);

I = soil erodibility (tons/acre-year)

= 134 (4);

K = surface roughness (dimensionless)

= 1.0 (worst case assumed);

C = climatic factor (dimensionless)

= 200 (4);

L = unsheltered field width (dimensionless)

= 1.0 (worst case assumed);

V = vegetative cover (dimensionless)

= 1.0 (worst case assumed).

Therefore, for disturbed areas in central Arizona, an emission factor of 5,360 lb/acre-year was computed. Using the assumption that 1/10 of the site area (64 acres) will be disturbed at any one time, an annual emission of 171.5 tons of particulates was obtained.

The annual particulate emission rate was computed by combining the emissions resulting directly from construction with those occurring from wind erosion. Thus, the estimated annual emission rate is:

21.77 tons/yr + 171.5 tons/yr

= 193.27 tons/yr or 5.6 g/sec.

The daily emission rate is computed to be 7.7 g/sec, which is higher than the annual average emission rate since emissions from construction operations take place for 8 hours/day for approximately 250 days/year. Both the daily and annual emission rates were used in the modeling analysis.

EMISSION CALCULATIONS - VOLATILE ORGANICS AND HAZARDOUS EMISSIONS

Overview

The technique for estimating air emissions of hazardous or volatile organic compounds from waste facilities are not well developed, since such emissions have become of concern only in recent years. In addition, very little is known about the types and quantities of materials that will actually be treated at this particular facility. As such, the emission rates given below must be regarded as highly speculative estimates only, and must be treated as such. However, assumptions made in this analysis are on the conservative side, given the data in Table D-2, and may actually overestimate emissions and the resulting impact on the environment.

Surface Impoundments

Hazardous Emissions--

Based on the types of waste generated in Arizona in 1982 (Table D-2), it is expected that three types of waste solutions will be placed into the surface impoundments: acid/alkali mixtures; cyanide solutions; and wastewater with heavy metals. Since most of the potentially toxic materials in these solutions will be solids or precipitate out of solution, no significant emissions of toxic compounds from these waste categories are expected, under normal operating conditions. It is possible, however, that during mixing of strong acids and bases, the change in pH and temperature could produce gaseous emissions.

Organic Emissions--

While the present design for the facility does not call for disposal of organic compounds in the surface impoundments, facilities receiving wastes from industries similar to those identified in the EIS have allowed disposal of volatile organics in surface impoundments. Empirical measurements of hydrocarbon emissions from surface impoundments in a somewhat similar facility in New York state show hydrocarbon emission rates of 40 tons/year (7).

Landfarm

Volatile Organics--

Two types of wastes may be treated by injection into the landfarm: "various solvents" and "biodegradable organics" (Table D-2). In 1981, the amounts of wastes generated in these two categories were 300 tons and 238 tons, respectively, for a total of 538 tons/year of hydrocarbons (Table D-2). The following equation was used to estimate the emissions which could emanate from the landfarm (8):

$$W_A = \left(\frac{538\ \text{tons}}{\text{year}}\right)(V)$$

W_A = emission rate (tons/year)

V = fraction of hydrocarbons which are assumed to be volatile.

Two values for V (0.05 and 0.30) were used to obtain a range of emission estimates:*

W_A = 27 tons/year (0.05 volatility)

W_A = 161 tons/year (0.30 volatility).

---

* These values for V were chosen because the volatility of separator sludge, which is generally treated via landfarm injection, has been shown to fall approximately in this range (9). Depending on the physical nature of the solvents which are actually injected into the landfarm, the actual volatilities may differ from the values chosen here.

The present plan for the facility projects that all or part of the compounds in the "various solvents" category may be treated via solvent recovery instead of being landfarmed. In the event that all 300 tons of the "various solvents" were treated via solvent recovery, and assuming a 10 percent loss of hydrocarbons from the solvent recovery process, the hydrocarbon emission rates from solvent recovery and the landfarm can be calculated as follows:

$$W_{SR} = (300 \text{ tons/year})\ (0.10) = 30 \text{ tons/year}$$

$$\begin{aligned} W_{LF} = (238 \text{ tons/year})\ (V) &= 12 \text{ tons/year } (V = 0.05) \\ &= 71 \text{ tons/year } (V = 0.30). \end{aligned}$$

Thus, the total emissions under these conditions from solvent recovery and landfarm combined would range from 42 to 101 tons/year (Table G-3).

Hazardous Emissions--

Emission rates were also estimated for selected specific compounds. To make these estimates, it was assumed arbitrarily that the chemical in question will be exposed to air on half of the landfarm surface, and will be buried beneath 15 cm of soil on the other half. The following relationship was used to estimate emissions (10):

$$E = (2M/22.4)(p/760)w[(D\ L\ v)/(\pi\ Fv)]^{1/2} W_i$$

where:

E = emission rate (ug/m^3)

M = molecular weight of the compound

p = vapor pressure of the compound (mm)

w = width of the landfarm (cm)

D = diffusion coefficient of the compound (cm^2/sec)

L = length of the landfarm (cm)

F_v = 1 (assumed)

W_i = weight percent of the compound in the waste (g/g)

The volatilization of the unexposed hazardous material is described by Shen (10), as follows:

$$w_i = D_1 C_s A P_t^{4/3} (W_i/L)$$

TABLE G-3. ESTIMATED EMISSIONS OF HYDROCARBONS

Treatment	Emission Rate (tons/year)
Surface impoundment	40
Landfarm	27-161*
Landfarm and solvent recovery	42-101*
Landfill	40-157*

* These are ranges of estimated emission rates, see text for discussion.

where:

E_i = emission rate of the compound (g/sec)

D = diffusion coefficient of the compound (cm^2/sec)

A = exposed area (cm^2)

C_s = saturated vapor concentration of the compound

P_t = soil porosity (dimensionless)

L = effective depth of soil cover (cm)

W_i = weight percent of the compound in the waste (g/g)

Emission rates were calculated for allyl alcohol, dimethyl sulfate, formic acid, and phenol, as all are potentially toxic compounds which may be treated in the landfarm (11). These emission rates are given in Table 4-1, main text.

Particulate emissions are expected during the tilling operation. The dust emission can be estimated using the following equation (3):

$$EF = 1.4S/(PE/50)^2 \qquad (3)$$

where:

EF = emission factor (lbs/acre)

S = silt content (%)
= 15% (assumed)

PE = Thornthwaite's precipitation-evaporation index
= 18 (Mobile site)
= 6 (Western Harquahala Plain and Ranegras Plain sites)

Therefore,

EF = 162 lb/acre (Mobile site)
= 1,458 lb/acre (Western Harquahala Plain and Ranegras Plain sites).

The surface area of the landfarm is 2.15 acres; if it is assumed the landfarm is tilled twice per month, then the particulate emission rate is 8,300 lb/year for the Mobile site and 75,000 lb/year for the Western Harquahala Plain and Ranegras Plain sites.

Landfill

Volatile Organics--

Emission rates estimated for organics evolved from the landfill were obtained by assuming 196 tons/year of halogenated organics are processed in the landfill (Table 1-1, Table D-2). Emission rates were calculated as follows:

W_A = (196 tons/year) (V)

W_A = emission rate (tons/year)

V = fraction of hydrocarbons which are assumed to be volatile.

Two values for V (0.20 and 0.80) were arbitrarily selected, to obtain a range of expected emission rates (Table G-3). Should the volatilities of the compounds actually treated differ significantly from the values of V chosen, the emission rates will change accordingly.

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APPENDIX H

COCCIDIOIDOMYCOSIS

HISTORY

Coccidioidomycosis (kok-sid-ee-oid-o-my-ko-sis), commonly known as Valley Fever, is a disease caused by the fungus *Coccidioides immitis* (1, 2, 3). The disease was first reported and described in Argentina in 1892; additonal cases were reported in the San Joaquin Valley in California in 1896 (1). The fungus was found in soils in California as early as 1932, and in Arizona in 1937; Arizona came to be recognized as an endemic Valley Fever region. Studies of the disease in the 1930's in the San Joaquin Valley found that there was a seasonal variation in incidents of the disease, and that a greater probability of secondary infection existed for "non-white" persons (1).

In 1941, the first large-scale study of the disease commenced in the Southwest as a consequence of the location of Army camps in the area. The program revealed a substantial number of cases of Valley Fever. It was at that time that the first preventive measure, dust control, was implemented.

It is widely accepted that the Valley Fever spores are spread by air and that they enter the body by the respiratory route (3). Special problems arise when the spores become airborne and are transmitted to population centers. In 1977, a wind storm in the San Joaquin Valley, transported spores over 300-miles, resulting in a significant increase in the incidence of primary Valley Fever in the communities where the spores were deposited (4).

Attempts to capture and isolate the spores in airborne dust away from areas of origination have not yet been successful. For example, a study in Phoenix in 1959 examined 89 air samples (more than 610,000 liters [21,000 cubic feet] of air), of which only two specimens proved positive (5). There is a critical lack of knowledge about spore transmission through environmental media (e.g., survivability in air, settling patterns, and density dispersion from the source) (6).

DISEASE MANIFESTATION

The more common, nonfatal form of the disease is known variously as San Joaquin Valley Fever, Valley Fever, Desert Fever, and Desert Rheumatism. Valley Fever is normally contracted by inhaling the airborne spores found floating freely in dust clouds from previously undisturbed contaminated soils. It is believed that over two-thirds of all adults living within these contaminated regions for several years or more have been infected by the fungus. Individuals who have lived in the Phoenix area for a period of at least 2 years have a greater than 80 percent chance of contracting the disease (7). This particular fungus affects the lungs and other internal organs.

Whether or not a person becomes ill as a result of the first exposure to Valley Fever spores, the resultant infection confers a life-time immunity to subsequent infection. The majority of people exposed to Valley Fever spores (60 to 70 percent) experience no sign of illness at all. However, skin tests performed on these persons will indicate the presence of infection.

Approximately 30 to 40 percent of those infected by the Valley Fever spores become sick. In most cases, the primary stage occurs in a very mild form which closely resembles a bad cold or the flu. The first symptoms usually appear within a week to 10 days after initial exposure to the spores. The patient may experience any one or a combination of symptoms, including fever, coughing, chest pains, nausea, and a general feeling of malaise (1). A week or two after the fever rises, some patients may develop a skin rash, most commonly on the legs (8). These symptoms usually disappear after 2 or 3 weeks of rest and a careful diet, although it may be several months before the patient regains complete strength.

During the primary stage, no special medication is required beyond the body's natural defense system. The few spores which are able to get through the body's defense mechanism may become lodged in the smaller air sacs of the lungs, where they grow and multiply. The body's immune system reacts to the inflammation of lung tissue surrounding the growing fungus by developing small patches of fluid (edema). Scar tissue may develop as a consequence of this growth.

When the spores grow in the lungs and edema occurs, the disease is said to be in its primary stage. However, if the fungus is able to spread to other internal organs (i.e., bones, lymph glands, intestines, spine, brain, or skin), the disease is in a much more serious stage known as the disseminated stage (7). The disseminated stage of the disease is very rare and usually proves to be fatal even with the most modern treatment methods. The number of serious cases may account for less than 1 percent (7). Patients who contract this stage often experience high fevers and extreme fatigue. The disease cannot be transmitted from one person to another, because the spore does not have a communicable stage in its life cycle.

GEOGRAPHIC DISTRIBUTION

The fungus is generally found in the semiarid regions of the southwestern United States, from western Texas to central California. The fungus thrives in the region defined by ecologists as the "lower Sonoran life zone." This particular habitat is characterized by long, hot, dry summers, followed by mild winters with low to moderate amounts of rainfall (arid or semiarid climates) (3). The spores are generally recovered from sandy, alkaline soils. The distribution of the fungus in the upper soil layer is generally patchy.

There is some evidence that soil temperature and humidity affect the distribution of the fungus. Recovery of the fungus from soils at the ends of dry seasons was found to be much more difficult than during wet seasons. In one test, the fungus was recovered from the surface soil samples (1/4 inch below the surface) at the end of the wet season, while fewer were recovered from the surface during the dry season. In Arizona, spores have been recovered in soils at depths of 1 inch to 1 foot (6). In laboratory tests, a "drier strain" of the species was found to die in 2 weeks at 50°C, but remained unchanged for months at temperatures of -15°C to 37°C (3). It seems likely that, in arid environments, the fungus may become sterilized in the top 1/4 inch of soil in summer, and remain at depths below its temperature tolerance. During the fall months, the fungus grows closer to the surface as moisture is absorbed (6).

The spores are unevenly distributed geographically even within endemic regions. In Arizona, contaminated areas occur largely in the arid southern half of the state. The fungus is especially prevalent in the Phoenix and Tucson areas. In 269 field samples tested by Leathers, spores which induced Valley Fever were recovered from 31 samples. These samples were found near the village of Maricopa, Arizona (5). The city of Florence, between Phoenix and Tucson, is reported to have high attack rates of Valley Fever. The Rainbow Valley area has been characterized as a "hot spot" for recovering the fungus spores from soil samples (9).

DISSEMINATION AND EXPOSURE

The general consensus is that the spores are released as a consequence of the disruption of soil and airborne. The spores are known to be transported by wind, and may affect individuals outside the endemic area. The spores are more easily recovered in strong dust storms. On December 20, 1977, high-velocity winds centering around Aryin, Kern County, California, gusted up to 99 miles per hour. The dispersion of soil containing spores resulted in an epidemic of Valley Fever in an area of approximately 33,590 square miles. Topsoil had been removed to a depth of 6 inches, and a huge dust cloud had reached an elevation of approximately 4,900 feet. Within 20 hours after the storm began, a prevailing southerly wind carried the contaminated dust up the

San Joaquin Valley to Sacramento, 310 miles to the north. The settling dust produced hazy atmospheric conditions as far as 430 miles from the point of origin (4).

As a result, the California Department of Health Services recorded approximately 550 cases of Valley Fever in the first 16 weeks of 1978. This may be compared to the 175 cases recorded for the same period in any of the preceding 10 years. In Sacramento County alone, 115 cases of Valley Fever were reported, in contrast to a maximum of 6 cases per year recorded over the previous 20 years. The Kern County storm resulted in medical care costs exceeding $1 million (4).

In Arizona, the incidence of infection increases during the summer months; this increase may correlate with the occurrence of dust storms affecting metropolitan areas (5). Seasonal variation in infections may be related to regional rainfall patterns. The incidence of infection increases in seasons with little or no rainfall (3). The growth of the fungus requires only a few weeks of moisture, and wind borne transportation of spores is reduced during rainy seasons.

While certain locations in Arizona are recognized as areas of high endemicity, infections are geographically dispersed because of the spores become airborne. However, there is evidence of concentrated infections occurring at particular sites where soil disruption has resulted in heavy exposure to dust (5). The relationship between Valley Fever and employment in soil-related activities (e.g., agriculture, construction) has been recognized for a long time (6).

Activities that disrupt the soil surface, such as road maintenance and other construction work, contribute significantly to the risk of infection for both residents and workers. Occupational Valley Fever is an ongoing hazard. Persons employed in agriculture, archaeology, or construction (i.e., heavy equipment operators and surveyors) face a greater possibility of contracting the disease than the general public (3).

ATTACK RATES

It is believed that over two-thirds of all adults living within endemic regions for several years have been infected with the fungus. Approximately 60 percent of the infected persons do not develop symptoms, and the infection is only confirmed by a positive coccidioidon skin test. For the remaining 40 percent (with symptoms), most infections are benign, but 1 percent may develop a serious case (3, 7).

Current data indicate that natural reinfection is extremely rare; thus, infections will usually occur only in individuals not previously infected. There is some evidence that Valley Fever is influenced by intercurrent conditions or superimposed diseases. In a review of 25 fatal cases of Valley Fever in Phoenix, it was found that 84 percent of the fatalities had an underlying influential disease (3). Based on statistics for the 1970's, an average of 27 deaths are annually associated with Valley Fever in Arizona (5, 6, 9).

Medical authorities have recommended that individuals whose occupations require close and prolonged contact with the soil in endemic areas should take extreme precautions. There may be a relationship between the concentration of exposure and the severity of the infection (6). It is possible to acquire Valley Fever outside of endemic areas through contact with spores that have become attached to clothing or other articles (4). People have been known to introduce the spores into their homes after bringing dusty clothes back from contaminated areas.

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APPENDIX I

LAND USE

The intent of the land use inventory was to identify, map, and delineate all existing, planned, and officially designated land uses within and adjacent to the three candidate sites. An area within 2 miles of each site was delineated as the area to be studied on the premise that 2 miles represented the maximum sphere of influence from a land use sensitivity perspective.

The methods used in the land use study included review and refinement of previous studies within the study area (1, 2, 3, 4, 5, 6, 7, 8, 9, 10). In addition, an extensive investigation and interpretation of related existing maps within and adjacent to the candidate sites were undertaken (11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38) Mapped information was verified during one day of ground reconnaissance.

The following secondary sources provided the bulk of the data portrayed in this report: (a) the Santa Rosa to Gila Bend 230kV Transmission Project Corridor Studies - Land Use Report (10); (b) Palo Verde-Devers 500kV Transmission Line, Final Environmental Statement (7); (c) Salt River Power Plant Siting Study, Phases 2 and 4 (9); (d) individual contacts with federal, state, regional, and local governmental agencies made by telephone and meetings (39, 40, 41, 42, 43, 44, 45); (e) published maps, reports, or other public documents (11, 10); and (f) BLM Master Title Plat Maps and U.S. Geological Survey 7.5- and 15-minute topographic quadrangle maps (34, 35, 36, 37, 38).

The following text defines (by study component) the land use features identified in the results section. The land use components are addressed according to all inventory categories listed and descriptions of each land use subcategory.

LAND JURISDICTION

Land jurisdiction depicts the limits of administrative or jurisdictional control maintained by the major landholders within the study area boundary. Three categories of land jurisdictions were identified and delineated, primarily from Arizona State Land Department (ASLD) and BLM Surface Management maps (19, 20, 21, 28, 30): Public Land (BLM), Arizona State Trust Land, and Private and Other.

- Public Land: Includes all lands administered by the U.S. Department of Interior, BLM. The management authority for these lands stems from the Federal Land Policy and Management Act of 1976 (FLPMA), and follows principals of multiple use and sustained yield in accordance with developed land use plans (46).
- Arizona State Trust Lands: Includes all land that is under the jurisdiction of the ASLD, and represents lands held in trust by the State of Arizona.
- Private and Other Land: Includes all land in the study area not otherwise jurisdictionally designated in one of the above categories.

EXISTING LAND USE

This category identifies the various types of land uses found within the area at the time of study (July 1982). Definitions of land use components addressed in this section are listed below.

Parks and Recreation/Preservation

Two subcategories of parks and recreation/preservation areas were identified: (a) hiking and riding trails (existing and proposed trail systems designated by state or county parks departments), and (b) Wilderness Study Areas (WSA's). In 1976, the FLPMA directed that lands under BLM jurisdiction be inventoried and evaluated with respect to wilderness potential for possible inclusion in the National Wilderness Preservation System. The initial wilderness inventory of public lands in Arizona was completed in September 1979. The BLM has conducted an intensive inventory, which involved field verification of wilderness characteristics of the remaining lands. Completion of a management review resulted in the recommendation, subject to public review, that only Intensive Wilderness Inventory Units 2-138, 2-142/144, 2-157, and 2-155B have wilderness characteristics that may qualify them for approval as WSA's. The intensive inventory was completed in June 1980, and final WSA determinations were made in November 1980 (46, 47).

Agricultural

This type of land use includes livestock grazing and associated range improvements connected with its use. Range improvements, such as water developments, corrals, fences, etc., are needed on most BLM grazing allotments to implement the grazing systems.

Utilities

This type of land use identifies significant linear features within the study corridor. Utilities include all major existing or proposed utility transmission rights-of-way. The subcategories are: (a) lattice tower transmission line; (b) wood-pole transmission line; (c) major pipelines; and (d) major canals.

Transportation

This type of land use identifies two subcategories: (a) railroads and (b) highways. The railroad subcategory was defined to include all railway transportation facilities in active use. All significant roads and highways within the study corridors were also identified, including Interstate Freeway, Other Paved Road, Unpaved Improved Road, and Unimproved Road.

FUTURE LAND USE

This category defines all general and specific planned land uses not otherwise identified in the preceding components within 2 miles of the candidate sites. Four types of future land use information was included: (a) those project uses that are embodied in the officially adopted general and comprehensive plans for the area; (b) specific development plans relating to future urbanization; (c) comments from planning officials representing federal, state, county, and local governmental agencies having management responsibilities in the study area; and (d) existing zoning ordinances.

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APPENDIX J

VISUAL RESOURCES

Visual resources assessment was performed for the area within 3 miles of each of the proposed and alternative sites. Thus, a total study area of 49 square miles and 56 square miles was evaluated for the proposed and alternative sites, respectively.

The visual resources study was conducted with BLM's established methods (1), which provided guidelines for assessing the potential visual contrast of the proposed activities.

The overall process included an inventory of the inherent character and quality of the landscape, the sensitivity of the land and the people who use it, and a summation of viewer/landscape distance relationships from specific points and travel routes. This information was synthesized to determine visual management objectives for the range of conditions that exist. In addition, the study addressed two related issues: the type and extent of the actual physical contrast that could potentially occur, and the level of visibility that each site would have.

The data base for visual resource assessment was obtained from the BLM-Phoenix District Office and the Santa Rosa to Gila Bend 230 kV Environmental Assessment (2). Additional data were collected from 15-min USGS topographic quadrangles and a 1-day field review.

The four inventory categories that have been established for the visual resource study are Scenic Quality Classes, Visual Sensitivity Levels, Distance Zones, and Tentative Visual Management Classes.

SCENIC QUALITY CLASSES

All three sites were evaluated in terms of landform, vegetation, color, uniqueness, adjacent scenery, and existing cultural modifications (1). Designations of Class A (high visual quality), Class B (common visual quality), or Class C (minimal visual quality) resulted.

VISUAL SENSITIVITY LEVELS

Visual sensitivity is a function of three variables: the attitudes of the public using the area, the number of people who view the area, and the portion of the landscape that can be seen.

User attitudes indicate the relative degree of user interest in visual resources and concern for changes in the existing landscape character. BLM data provided the levels of visual sensitivity (1).

DISTANCE ZONES

Once key observation points were established through the use-volume inventory and "seen areas" delineated, foreground/middleground and background distance zones were mapped, based primarily upon BLM URA's (1). No "seldom seen" areas were identified.

TENTATIVE VISUAL MANAGEMENT CLASSES

Tentative visual management classes were derived by combining scenic quality classes (A, B, and C), visual sensitivity levels (high, moderate, and low), and distance zones (foreground/middleground, background, and seldom-seen areas). Combinations of the nine individual variables produced a range of possible conditions varying from low sensitivity, low scenic quality and unseen areas (Class IV), to a highly sensitive area which has distinctive visual quality, and is in the foreground (Class I or II).

This range of conditions was categorized into management classes (I, II, III, and IV) that have definitive threshold limits. Each class, as defined by the BLM (1), has specific visual management objectives which clearly describe the degree of modification allowed, and the degree to which that modification can contrast with the natural landscape.

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APPENDIX K

CULTURAL RESOURCES: ARCHAEOLOGICAL

Early occupation (as early as 40,000 years ago) of southern Arizona by a pre-projectile-point culture has been hypothesized, but remains controversial (1). Sites containing fluted projectile points typical of the Paleo-Indian period (12,000 to 8,000 years ago), an economy considered to have been based largely on hunting of large game, have been recorded in southern Arizona (2, 3, 4, 5, 6).

As early as 9,000 years ago, the Archaic cultures of the desert were beginning to emerge. These cultures are generally considered to have been adapted to conditions of increased aridity, and to have practiced a generalized hunting and gathering subsistence strategy (7). In southern Arizona, there is tentative evidence of at least two major cultural traditions within the Archaic (1).

The earliest manifestation of a western-based Archaic tradition is generally called the San Dieguito complex (8, 9). The Amargosa complex represents a later occupation (about 6,000 years ago), and the archaeological evidence suggests also a hunting-gathering economy, but with an emphasis on seed grinding (1).

The southern Archaic tradition is generally called the Cochise culture (6, 10). A three-period sequence for the Cochise culture has been established in the San Pedro Valley: the Sulphur Spring phase (9,000 to 5,500 years ago), the Chiricahua phase (5,500 to 3,500 years ago), and the San Pedro phase (3,500 to 2,300 years ago). Most of the known sites are small habitation sites which contain a large number of grinding stones used in processing wild plant foods. Most known sites are associated with permanent water sources. Numerous lithic sites that are probably Archaic have been found along Vekol Wash and it has been suggested that the Mobile Valley may produce similar sites (11).

The Hohokam tradition existed in south-central Arizona from approximately 2,300 years ago until less than 500 years ago (3, 12). As opposed to their Archaic predecessors, the Hohokam practiced agriculture, manufactured pottery, and lived in permanent villages (13, 14, 15). Two separate branches of the Hohokam have been defined, based on differences in material culture and subsistence practices. The River Hohokam, concentrated in the Gila-Salt Basin, relied on canal-irrigated agriculture with a secondary emphasis upon gathering wild plant products. The

Desert Hohokam, living in the more arid environment of central Papaqueria, obtained the bulk of their food source through hunting and gathering. The Hohokam tradition disappeared about 500 years ago, perhaps as a consequence of unfavorable changes in climate. It is generally believed that the historic Pima and Papago are the modern descendants of the Hohokam.

Little is known of the Hakatayan tradition in southern Arizona. It is generally accepted that the tradition began about 1,300 years ago and lasted into historic times (17, 18, 19). The Hakatayan people practiced maize agriculture and made pottery, as did the Hohokam, but did not evolve as complex a social organization as did the Hohokam, and generally practiced a more mobile lifestyle (19). Hakatayan materials have been recorded along the Gila River as far east as the Sierra Estrella Mountains (16, 20, 21, 22, 23, 24). The Hakatayan tradition is thought to be ancestral to the historic Yuma, Opa, and Coco-Maricopa of southern Arizona.

For the purposes of this EIS, an area within 2 miles around each site was delineated and included in the assessment. In accordance with general archeological theory which considers the correlation between site location and environmental features (25, 26, 27, 28, 29), certain environmental data, such as water, vegetation, soils, and geology, are required to determine the probability of encountering sites. These respective data were obtained from Arizona drainage maps (30), maps of natural vegetative communities in Arizona (31), and USGS maps (32). The data revealed that there are few sources of food and water available in the study area, which is expected to have low archeological site density.

The literature review and records searches revealed that the study areas have not received intensive archeological investigations.

The Phoenix District of the BLM conducted a Class II Cultural Resources survey (sample survey) of the three candidate sites in May 1982 (33). Five parcels of 80 acres were randomly selected for each of the candidate sites. A single artifact was found during the survey of the Harquahala Plain site. Previously, BLM conducted Class I overviews of the Rainbow-Stanfield Planning Unit (34), Vulture Planning Unit (8), and the Little Horn Planning Unit (35).

Other projects, primarily linear right-of-way surveys, traversed areas adjacent to the candidate facility sites.

Gratz (of the Museum of Northern Arizona) surveyed a section of right-of-way for the proposed El Paso Natural Gas Company mid-continent/west coast oil pipeline (34). This right-of-way traverses both Harquahala and Ranegras Plains. No sites were recorded in the study areas.

In 1978, the Office of Cultural Resource Management of Arizona State University conducted a survey for the Granite Reef Aqueduct of the Central Arizona Project which crosses the Harquahala Plain (36). No sites were recorded in the study area.

Wirth Associates conducted a regional overview and corridor studies, including survey for the Santa Rosa to Gila Bend Transmission Line Project (37). During the regional studies, it was determined that the area in Rainbow Valley has a low probability of encountering sites and no sites were recorded during the survey.

The Museum of Northern Arizona conducted a survey along the alternative corridors for the Palo Verde to Devers Transmission Line Project (38). WESTEC Services, Inc., surveyed the final transmission line corridor, and has completed mitigation work for the project (39). Sites were recorded along the section that traverses Harquahala and Ranegras Plains. The sites consisted primarily of temporary camps and lithic scatters.

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APPENDIX L

CULTURAL RESOURCES: HISTORICAL

Historical resources, termed "sites" in this report, are defined as the remains or locations of past events or cultural processes. For the purposes of this EIS, a study area within 2 miles around each alternative site was delineated and included in the study. In addition to specific references cited, the description of the affected historical resources was also based on the Arizona Survey plats (1) and maps (2, 3, 4), as well as recent environmental studies in the area (5, 6, 7).

Although the earliest documented history of Arizona dates from 1539, when the Spanish explored the northern outposts of their empire in North America, the first extended explorations of the region did not take place until 1699, when the Jesuit missionary Father Eusebio Kino made expeditions to the Gila River. Father Kino traversed the area from west to east over a trail which would later serve as an overland route to California (8). This trail, the Gila Trail, generally followed the southern banks of the middle and lower Gila River (9). From the Pima Indian villages or Maricopa Wells to Gila Bend, however, the trail left the river (to avoid the big bend in the river southwest of present-day Phoenix) and went west across the "forty-mile desert."

The Spanish made no settlements in the area because of raids by the Apaches, with whom they did not make peace until about 1790 (8).

During the 1820's, southern Arizona became part of the newly independent Republic of Mexico and at the same time part of the United States frontier (10). The Apache, no longer quiescent, forced Mexican ranchers and Spanish missionaries to flee into present-day Mexico. This left the Gila River and other waterways open to Anglo-American fur trappers, who reopened the Gila route to California (11).

The acquisition of California was the primary objective of the U.S. in the war with Mexico, which was declared in 1846. During the war, the Gila Trail became a military route and later a wagon road that served as a crucial overland link between California and the rest of the United States until 1877, when the Southern Pacific Railroad reached the area (12, 13, 14).

Beginning in 1848, thousands of "Forty-Niners" made their way to the California gold fields via the Gila Trail. The first permanent Anglo-American settlements were established in the general area in the 1850's, and in 1857 a mail route between San Antonio and San Diego was operating along the Gila Trail (11). Eventually, the stage route (known as the Butterfield Stage) operated along the Gila Trail intermittently, and stimulated some development in the area (15). The first "rapid" communication began in 1873 with the implementation of a military telegraph system constructed along the Gila Trail between Maricopa Wells and Gila Bend (16, 17), while private systems came into operation much later.

During the construction of the transcontinental railroad, temporary camps for the laborers were set up along the tracks (14). On a more permanent basis, the Southern Pacific Railraod established sidetracks, way stations, and/or water and telegraph stations at such sites as Mobile and Estrella (18). None of the stage stations, however, were located in the study area.

The two principal establishments were Gila Bend Station and Maricopa Wells (19). In 1881, the Gila Trail/Butterfield Stage Route was replaced by the completed railroad. The railroad allowed secure development in the region by integrating the Southwest into the industrial economy of the nation. Its first effect was to permit the large-scale exploitation of precious metal resources, due to increased accessibility (20).

The first automobile roads in the area followed the tracks of the Southern Pacific Railroad so that assistance could be obtained in case of an emergency. Later, more direct routes were established for automobiles and trucks (21, 22, 23).

During World War II, practice maneuvers were conducted in the general vicinity of Harquahala and Ranegras Plains. Bunkers have been recorded in the area.

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APPENDIX M

CULTURAL RESOURCES: NATIVE AMERICAN

Native American tribes which inhabited and utilized the study area in Rainbow Valley were the Maricopa, Papago, and Pima. The Maricopa settled in the area following their move from the Colorado River. The Pima entered the study area from their primary ancestral lands situated to the northeast, and the Papago migrated from their traditional area to the south. Other tribes, such as the Apache, entered the study area on occasion for purposes of trade and in times of war. The Maricopa, Papago, and Pima utilized resources in the Rainbow Valley for subsistence. The surrounding Sierra Estrella and Maricopa Mountains were also important resource areas. Both mountain ranges played an important part in their religious heritage. There are remains of habitation sites, rock art, and reliquaries in the mountains.

The Maricopa (collectively the Opa and Cocomaricopa) at one time inhabited the lower Colorado River area. By the time of contact with the Spanish, however, they had moved eastward through the Kofa and Castle Dome Mountains to live along the Gila River (1, 2). They inhabited the lands on both sides of the Gila from Sacate and Pima Butte to Gila Crossing with most settlements downstream from Sacate and eventually allied with the Pima (2, 3).

At the time of Spanish contact, the Uto-Aztecan-speaking Pima were settled in the San Pedro Valley from the Tombstone area to the Gila River, the Santa Cruz Valley from Tucson to Red Rock and along both sides of the Gila River from the Casa Grande area west to approximately present-day Gila Bend (4). Currently, the Pima share three reservations with the Maricopa and Papago. Traditional Papago territory included the mountains south of the Gila River from present-day Tucson west to the Yuma desert (5). Although the Papago utilized resources along the lower Gila River from prehistoric times, they did not settle in the study area until the latter part of the nineteenth century, probably after the Cocomaricopa abandoned the area and after the cessation of Apache raids. Papago settlements centered in the Gila Bend region. At one time, they occupied an area along the lower Gila River. Their actual territory, however, was primarily south of the International Border (6). The Papago are currently one of the largest Native American tribes in Arizona. Most are situated on one of the two Papago reservations, although they share several others with the Pima and Maricopa. Other Papago live off the reservations in both urban and rural areas.

Tribal groups with a cultural heritage in the Harquahala and Ranegras Plains include the Gila Pima, Maricopa, and Yavapai. Agriculture, gathering, and hunting were pursued in the mountains and deserts surrounding the study areas. Habitation sites, trails, rock art, and reliquaries attest to tribal activities here.

Archaeological remains and historic documentation attest to Northern Piman-speaking peoples utilizing the desert between the Gila River and Parker Valley from prehistoric times to the nineteenth century (7). The Gila Pima, whose settlements lay along the Gila River, sustained themselves through the use of varied floral, faunal, and mineral resources of this desert region. Gila Pima professional traders passed through the study area via Centennial Wash to Panya County (8). During historic times, the western Apache and Mojave raided Gila River Pima settlements, which restricted Gila Pima settlements and curtailed their utilization of the Harquahala and Ranegras Plain regions by the end of the seventeenth century.

During the same period, the Panya, a Maricopa minority living among the Pima, already resided on the Lower Gila River downstream from its Great Bend (9, 10). They raised food crops on sand bars flooded by spring rises of the Gila River, and acquired abundant catches of fish from the stream. They also ranged out over the desert to collect wild plant food products, particularly the fruit of the giant cactus and prickly pear cacti, and to obtain stone to fashion into various implements (11).

Historic evidence indicates that much of the Pima and Panya traders' travel was by way of a major trail between the Parker Valley and the Lower Gila River. The trail left what is now called Parker Valley near Bill Williams Fork. It turned southwest across the Harquahala Plain toward Saddle Mountain and the Palo Verde Hills, which were landmarks to guide them via Centennial Wash to the Lower Gila River on its Great Bend near the present city of Arlington (12). This route took travelers across the study areas.

In 1827, a tribe of the Mojave invaded Parker Valley and defeated the Panya, who fled across the desert above the Great Bend of the Gila River (2, 13). Their association with the study areas may have begun no later than the seventeenth century, and actual habitation ended between 1827 and 1846. As late as the early 1850's, the Maricopa collected in-season fruits of giant cacti on the "Gila Bend desert" (14).

The Yavapai, divided into Western, Northeastern, and Southeastern groups are a Yuman-speaking people who inhabited a vast territory from the Bradshaw and Mazatzal Mountains of central Arizona west to the junction of the Gila and Colorado Rivers (15). This tribal group entered the western lowland desert region, finding freedom from invasion only during the second quarter of the nineteenth century. After the Northern Band Panya exodus in 1827, and final disruption of native trading routes, neither Pimans nor other Yuman-speakers appear to have delayed the advance of Yavapai invasions of the desert. The study areas are located in the center of traditional western, or Tolkepaya, Yavapai territory (1). Euroamerican intrusion into Yavapai territory after 1850, initially accepted by the Yavapai, soon resulted in hostilities. In 1875, the Yavapai were forcibly ejected from the study area by U.S. troops. Few were able to return to the area, which continues to hold considerable symbolic significance to Yavapai individuals.

CONTACT PROGRAM SUMMARY

Person/Organization	Date	Medium	Subject
Dr. Ned Anderson, President Inter-Tribal Council of Arizona Phoenix, Arizona	07-16-82 08-17-82 08-20-82	Letter Letter Letter	Project Description Referrals Mailing List
Ms. Joan Enos, President Mohave-Apache Tribal Council Fountain Hills, Arizona	07-16-82 08-03-82 08-20-82 08-24-82	Letter Telephone Letter Telephone	Project Description Solicit Input Mailing List Message
Mr. Max Jose, Chairman Gila Bend Indian Reservation Gila Bend, Arizona	07-16-82 08-03-82 08-04-82 08-20-82	Letter Telephone Telephone Letter	Project Description Message Concerns Mailing List
Mr. Max Norris, Chairman The Papago Tribe Sells, Arizona	07-16-82 08-13-82 08-16-82 08-20-82	Letter Telephone Letter Letter	Project Description Message Tribal Resolution Mailing List
Mr. Dana North, Sr., Governor Gila River Indian Community Sacaton, Arizona	07-16-82 08-03-82 08-05-82 08-20-82 08-24-82	Letter Telephone Telephone Letter Telephone	Project Description Message Project Mailing LIst Concerns
Ms. Leona Kakar, Chairperson Ak-Chin Indian Community Council Maricopa, Arizona	08-04-82 08-13-82 08-20-82	Letter Telephone Letter	Project Description Concerns Mailing List
Mr. Herschell Andrews, Chairman Salt River Pima-Maricopa Community Scottsdale, Arizona	08-20-82	Letter	Project Description
Mr. Llewellyn Barrackman, Chairman Fort Mojave Tribal Council Needles, California	08-20-82	Letter	Project Description

Mr. Melton Campbell, Chairman Tonto Apache Tribe Payson, Arizona	08-20-82	Letter	Project Description
Mr. Anthony Drennan, Sr., Chairman Colorado River Indian Tribe Parker, Arizona	08-20-82	Letter	Project Description
Mr. Vincent Harvier, Chairman Fort Yuma Quechan Tribal Council Yuma, Arizona	08-20-82	Letter	Project Description
Mr. Delbert Havatone, Chairman Hualapai Tribal Council Peach Springs, Arizona	08-20-82	Letter	Project Description
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Mr. Ted Smith, Chairman Camp Verde Yavapai-Apache Camp Verde, Arizona	08-20-82	Letter	Project Description
Mr. Bill Tom, Chairman Kaibab-Paiute Indian Reservation Fredonia, Arizona	08-20-82	Letter	Project Description
Mr. Frank Fryman, Archaeologist Arizona State Parks Phoenix, Arizona	07-16-82 08-20-82	Letter Letter	Project Description Project Description

Ms. Pat Giorgio, Archaeologist State Director's Office Bureau of Land Management Phoenix, Arizona	07-16-82 08-20-82	Letter Letter	Project Description Project Description

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APPENDIX N

PUBLIC HEALTH AND SAFETY

The assessment of the risks from transporting hazardous waste materials is limited to examining the risks from shipping wastes from the Phoenix and Tucson areas to each of the three sites. Data on the volume of wastes generated in Arizona and the amount transported off site to treatment facilities are available through the ADHS (1, 2). According to the available data and interviews with state officials, approximately 75 percent of the wastes to be transported will be from the Phoenix metropolitan area, and 12 percent from Tucson. Thus, the risk analysis represents an assessment of nearly 90 percent of total wastes in Arizona to be transported to the proposed hazardous waste management facility.

The risk assessment used the State of Arizona's estimate that 5 million gallons per year of wastes will be shipped intrastate from the Phoenix area (3). The average volume of wastes per trip was estimated to be 2,500 gallons. Therefore, approximately 2,000 trips per year would originate from Phoenix and 320 trips annually from Tucson, based on an estimated 0.8 million gallons per year of shipped wastes.

The risk analysis followed these steps:

- Identification of routes. Likely routes from the two metropolitan areas to the proposed sites were identified. For each generation-destination path, a number of feasible alternative routes were selected for analysis.
- Determination of Accident Rate. For segments of each alternative route, the accident rate (number of accidents per million vehicle miles) was determined, using the accident statistics (4, 5).
- Determination of Accident Probability of Hazardous Waste Shipment. The accident rate (accidents per 1,000 vehicle miles) for each alternative route was first calculated. The probability (P) of a transit-related accident involving a hazardous waste carrier (number of accidents expected per year) was then determined by:

$$P(\text{accident segment } i) = x_i \text{ X } 1$$

where:

x_i = the segment accident rate (acc/vehicle mile)

l = the segment length in miles.

The risk assessment of transporting hazardous wastes was based on estimating the probabilities of accidents of hazardous waste carriers. Due to the lack of reliable data, the analysis did not consider probabilities of spills from carriers in nonaccident situations. Thus, the assessment may underestimate the level of risk.

- Determination of the Population Risk Factor. This risk factor can be defined as the product of the probability of an accident occurring and the exposure of hazards to the population if it does occur. The determination of transit-related risks involves the probability of a hazardous waste accident on a particular route times the population at risk (6).

The determination of the consequences of transit-related hazardous waste incidents (an occurrence which results in an unintentional release of hazardous material in transit) along a designated route is related to the types of material transported, the density of the population, emergency response characteristics (location/timing of occurrence, preparedness, and other related factors). Thus far, no relationship between the damage (consequences) and amounts spilled have been established using national statistics. Thus, the assessment of potential accident impacts was based on an evaluation of the distances that would likely be affected by hazardous waste spills. Table N-1 shows the impact area for hazardous waste spills by class. However, a hazardous waste spill may pose health hazards for longer distances, depending on the chemical, its concentration, and wind conditions.

Population along the alternative routes was measured using data from the 1980 Census Enumeration Districts (ED's) within impact areas in which population could be affected by a chemical release. While the ED's did not always conform to the potential impact area boundaries (they were often larger), in those cases, population at risk was estimated by evaluating settlement patterns and population densities, and taking a proportional share of population from the ED's.

Population within the Tucson and Phoenix impact areas was estimated on the assumption that 5,000 people would be exposed to risk per mile of interstate travel from the center of the cities (3). Lastly, the accident probability was multiplied by the estimated population in the impact area along the alternative routes to determine the population risk factor from which individual routes can be compared.

TABLE N-1. POTENTIAL IMPACT AREA BY HAZARDOUS MATERIALS PLACARD CLASS*

Class	Impact Area
Combustible Liquid	0.5 mi (0.8 km) all directions
Flammable Liquid	0.5 mi (0.8 km) all directions
Flammable Solid	0.5 mi (0.8 km) all directions
Oxidizer	0.5 mi (0.8 km) all directions
Poison	Downwind 0.2 mi (0.3 km) wide x 0.3 mi (0.5 km) long
Explosives	0.5 mi (0.8 km) all directions
Corrosive	Downwind 0.5 mi (0.8 km) long x 0.7 mi (1.1 km) wide

* Source: Reference 7.

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APPENDIX O

NOISE

SOUND MEASUREMENT

Sound is measured in units called decibels, abbreviated dB. Noise measurements are often weighted to better reflect sound as perceived by the human ear; these are referred to as "A-weighted" measurements, or dBA. Because the decibel scale is logarithmic, the change represented by the difference between dB numbers is greater than it would be on a linear scale. On the decibel scale, 90 is one-tenth the sound pressure of 100 dB, 80 is one-one hundredth the sound pressure of 100 dB, 70 is one-one thousandth the sound pressure, and so on. Typical noise levels are shown in Figure O-1.

ATTENUATION OF SOUND

Sound levels decrease, or attenuate, over distance. In a uniform environment, where the sound, or "propagation," path is homogeneous, sound will generally decrease 6 dB for each doubling of distance (1). Thus, if a source emits sound at a level of 85 dB measured at 100 feet, the sound level at 200 feet would be 79 dB; at 400 feet it would be 73 dB; and so forth. The rate of attenuation can be lower, depending on how sound spreads from the source (2). The actual level of decrease over distance in a specific situation also varies according to such factors as:

- The amount of sound absorbed by the earth's surface, the atmosphere, or objects in the propagation path.
- The amount of sound reflected by objects in the propagation path.
- Weather conditions.

OSHA NOISE STANDARDS

The Occupational Safety and Health Administration (OSHA) has set national standards designed to protect employees against hearing loss caused by long-term exposure to high sound levels in the work environment. These standards, presented in Table O-1, vary according to the amount of time the individual is exposed to the sound.

SOUND LEVELS AND HUMAN RESPONSE

COMMON SOUNDS	NOISE LEVEL (DB)	EFFECT
CARRIER DECK JET OPERATION; AIR RAID SIREN	140	PAINFULLY LOUD
	130	
JET TAKEOFF (200 FT); THUNDER-CLAP; DISCOTHEQUE; AUTO HORN (3 FT)	120	MAXIMUM VOCAL EFFORT
PILE DRIVERS	110	
GARBAGE TRUCK	100	
HEAVY TRUCK (50 FT); CITY TRAFFIC	90	VERY ANNOYING; HEARING DAMAGE (8 HR)
ALARM CLOCK (2 FT); HAIR DRYER	80	ANNOYING
NOISY RESTAURANT; FREEWAY TRAFFIC; MAN'S VOICE (3 FT)	70	TELEPHONE USE DIFFICULT
AIR CONDITIONING UNIT (20 FT)	60	INTRUSIVE
LIGHT AUTO TRAFFIC (100 FT)	50	QUIET
LIVING ROOM; BEDROOM; QUIET OFFICE	40	
LIBRARY; SOFT WHISPER (15 FT)	30	VERY QUIET
BROADCASTING STUDIO	20	
	10	JUST AUDIBLE
	0	HEARING BEGINS

SOURCE: "NOISE AND ITS MEASUREMENT." U.S. ENVIRONMENTAL PROTECTION AGENCY. FEBRUARY 1977.

Figure 0-1. Typical noise levels.

TABLE O-1. MAXIMUM PERMISSIBLE NOISE EXPOSURES FOR PERSONS WORKING IN NOISE ENVIRONMENTS

Duration Per Day (Hours)	Sound Level (dBA)
8	90
5	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

COMMUNITY NOISE

Outside of environments subject to consistently high levels of noise (such as some industrial work settings), noise problems generally relate to stress, annoyance, sleep disturbance, and interference with normal activities, rather than hearing loss (2, 3). Noise-related stress and annoyance vary widely from individual to individual and according to the particular circumstances.

IMPACT ASSESSMENT METHOD

Facility Noise

In order to determine the impact noise generated at the facility might have on facility workers and nearby communities, noise measurements were reviewed for an operating hazardous waste facility. Ambient noise levels* throughout the facility were found to be substantially below the levels permitted under the OSHA standards (4). The results of this study are given in Table 0-2.

Although the ambient noise levels were found to be below OSHA standards, various machines used during construction and operation of the facility could generate noise at levels up to 95 dBA at close range (5). Table 0-3 shows typical noise levels of such equipment measured at 50 feet. It should be noted that, due to the attenuation of noise over distance, the level emitted by the worst noise generator at one facility fell from 95 dBA at 50 feet to 69 dBA at 1,000 feet.

It is assumed that the highest noise level at the facility will be 95 dBA measured at 50 feet; attenuation at a rate of 6 decibels for every doubling of distance would then result in a noise level of 47 decibels at a distance of 12,800 feet (2.42 miles). Assuming the background noise levels in the three areas addressed in this EIS are typical of rural areas, 40 to 45 dB (3), noise generated at the facility should blend into the background noise at a distance of 2 to 4 miles.

Traffic Noise

Table 0-3 shows typical noise ranges for trucks and automobiles. The major source of traffic noise at the facility would be trucks; during the operating life of the facility, 2,500 truckloads of waste are expected annually. Assuming the facility

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* The ambient noise level is the overall noise level within a given area, as opposed to the specific noise level emitted by a particular noise source within that area.

TABLE 0-2. L_{10} NOISE LEVELS AT SELECTED KEY PROCESS POINTS THROUGHOUT THE SCA MODEL CITY (NEW YORK) FACILITY (4)

Location	L_{10} Noise Level (dBA)
Sanitary Landfill No. 7	63^{+10}_{-4}
Drum Handling Area	65^{+7}_{-4}
Receiving Lagoons	58^{+11}_{-5}
Redox Processing Area	66^{+5}_{-3}
Distillation Processing Center	62^{+8}_{-4}
Plant Entrance	60^{+10}_{-4}
Balmer Road	57^{+9}_{-3}

L_{10} is the noise level exceeded 10% of the time.

$L_{10} = 63^{+10}_{-4}$ means that L_{10} = 63 dBA with limits of 59 dBA and 73 dBA.

TABLE 0-3. TYPICAL NOISE LEVELS AT 50 FEET (7)

Equipment	dBA (at 50 feet)
Automobiles:	
Passenger Cars	68 to 78
Sports and High Performance	70 to 87
Economy and Compact	70 to 80
Imported	70 to 80
Trucks:	
Light	70 to 85
Medium	80 to 89
Heavy Duty	85 to 95
Earth Moving:	
Compactors (Rollers)	75
Front Loaders	70 to 85
Backhoes	70 to 90
Tractors	75 to 95
Scrapers	88
Graders	85
Pavers	90
Dozers	80
Materials Handling:	
Concrete Mixers	75 to 90
Concrete Pumps	85
Cranes (moveable)	77 to 90
Cranes (derrick)	90

operates 6 days per week, 8 hours a day, an average of one truck per hour would enter the facility. This volume of truck traffic would not be expected to increase the ambient noise levels along the access roads over a 24-hour period. The trucks would, however, cause intermittent noise intrusions which could be significantly higher than background noise levels along the roads. Such intrusions could be a nuisance or annoyance factor for exposed individuals.

Speech interference outdoors could be an indicator of the nuisance or annoyance impact of the truck traffic. Two persons speaking to each other outdoors at a distance of 2 meters (a little less than 6 feet) can effectively talk in normal voices if the background noise level is about 60 dBA or less (PS-36). Using a typical peak noise level for a medium- or heavy-duty truck of 84 dB (6) and assuming the same attenuation rate of 6 dB for every doubling of distance, the peak noise levels of a truck passing by could affect outdoor conversation within a range of 600 to 700 feet of the road. Again, this would vary according to the various factors affecting noise attenuation as well as the particular noise level generated by the particular vehicles.

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